Challenging Bipolarity in Persuasive Health Communication: Tests of the Activation Patterns and Consequences of the Approach-Avoidance Motivations Explaining Media Health Message Effects

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Dedication

This dissertation is dedicated to my dad in heaven, who motivated me to approach health communication research, and my mom, who motivated me to continue this journey.

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CHAPTER I. INTRODUCTION

The research presented here aims to provide comprehensive explanations for seemingly unsuccessful health campaigns and to provide guidance for the design and evaluation of persuasive health messages. In particular, this study challenges the bipolar conceptualization and measurement of motivational structure that is currently dominant in health communication research. For this purpose, I examine an alternative theoretical perspective regarding the structure of motivation systems and its implications in predicting message evaluation outcomes. Following the background of the present research, the extant literature that is pertinent to the purpose of this study will be reviewed. The review begins by providing the conceptualization of the approach and avoidance motivations underlying the formation of attitudinal or behavioral responses. Next, conflicting theoretical postulations regarding the structure of the valence systems of emotion/motivation will be discussed. Finally, this introductory chapter ends by presenting an overview of the main study and its analytical framework reported in Chapter 2 and Chapter 3.

Background: Bipolarity in Health Communication Research

The investigation of psychological message-processing mechanisms underlying attitudinal/behavioral change has long been at the core of health communication research. In particular, two major efforts have guided the design and evaluation of persuasive health messages. One approach concentrates mainly on increasing psychological

responses that motivate message recipients to move toward a persuasive goal (e.g., promoting healthy behavior) by attempting to make a health message stronger and more convincing (Knowles & Linn, 2004). The conventional use of explicitly persuasive language to increase argument strength/message effectiveness (Dillard, Weber, & Vail, 2007; Petty & Cacioppo, 1986) or the frequent use of sensational messages to draw recipients' attention to a message (Morgan et al., 2003; Palmgreen et al., 1991) are illustrative examples of this approach. Within this tradition, the typical outcome of interests is message acceptance, which is generally indicated by a positive change in psychological states, attitudes, intentions, or behaviors toward the message-recommended direction (Dillard et al., 1996; Witte, 1992).

Despite the efforts to determine an effective message that would draw positive psychological responses and, in turn, lead to message-aimed persuasion outcomes, there have been numerous occasions in which health campaign messages have failed to produce the desired effects (Noar, 2006; Rogers & Storey, 1987; Wakefield, Loken, & Hornik, 2010). In particular, conflicting evidence on the effectiveness of contemporary large-scale media health campaigns, such as the National Youth Anti-Drug Campaign (Office of National Drug Control Policy, 1998-present), has motivated health communication scholars to question why even a carefully-designed and pre-tested health message can have null effects or, even worse, boomerang effects.

Largely in response to discouraging findings, scholars have argued that more attention should be paid to message-processing mechanisms that might be responsible for a lack of change, or for changes that are in direct opposition to the message

recommendation to explain the failure persuasive health messages (Burgoon, Alvaro, Grandpre, & Voloudakis, 2002; Dillard & Shen, 2005; O'Keefe, 2003). This class of researchers has thus shifted its attention to a different type of motivational responses, which may make people want to avoid persuasive attempts or message-recommended behaviors (Dillard & Shen, 2005; Quick, 2012, 2013; Quick & Stephenson, 2008; Reinhart, Marshall, Hugh Feeley, & Tutzauer, 2007). One major theoretical framework that has gained particular interest from this group of scholars is the theory of psychological reactance (PRT: Brehm, 1966; Brehm & Brehm, 1981).

PRT focuses on an aversive motivational state (i.e., *psychological reactance*) that is hypothesized to occur when individual freedom is eliminated or threatened with elimination by external influence (Brehm & Brehm, 1981). The aversive motivation manifests by a movement away from the persuasion goal, such as performing the forbidden act or increasing liking for the forbidden choice, to re-establish that threatened freedom (Brehm, 1966; Brehm & Brehm, 1981). Given that a health campaign message can be easily perceived as an external attempt to influence an individual's sense of control over free behaviors and opinions, it is likely that the message motivates a person to (physically or figuratively) move in the opposite direction to the message recommendation. Thus, compared to the first line of research, which focused on increasing approach drives toward an intended change, research based in reactance theory focuses on reducing the occurrence of aversive motivations in response to explicit health messages by finding circumventive ways, such as the use of narrative/story-telling strategy (Green & Brock, 2000).

Studies using this reactance framework have greatly contributed to providing alternative interpretations of the unfavorable effects of health messages. However, their exclusive focus on the reactance process, operationalized as negatively-valenced cognitive and affective states (Dillard & Shen, 2005) implies the same potential problems with the first line of research tradition. For instance, in cases where reduced avoidance motivation is found to be not associated with (or negatively related to) positive attitude change, what explanations can be provided by researchers who only measured aversive motivation and exclusively focused on the role of the reduced avoidance motivation in the message process? In other words, this research tradition's exclusive focus on the avoidance motivational process also hinders the provision of a complete explanation for the effects of persuasive health messages as it does not consider the other force: approach motivation.

In summary, most extant work assumes that people are motivated either to move towards a particular health-relevant behavior or to move away from that behavior. Health message design similarly has focused mainly on increasing the motivation to move toward or to approach a recommended health behavior or on reducing motivation to move away from or to avoid the behavior. Thus, approach and avoidance motivation in this work is seen as conceptually unidimensional and bipolar. This conceptual tendency is directly linked to bipolarity in methodological approaches. For instance, the quintessential message evaluation measure in formative health research asks message recipients to rate a message on a bipolar scale with the anchors –3 (bad) and +3 (good) at each end. Accordingly, if an evaluative score obtained from the bipolar measure is

greater than 0, the message is believed to produce positive movement toward the goal. In contrast, if that assessment indicates 0 or a negative score on the bipolar scale, it is regarded as an unsuccessfully designed message that has little potential to produce positive persuasive outcomes.

Purpose of the Present Research

The above description of conventional approaches in health communication research motivated me to examine whether the two basic human motivations have been fully understood and considered in evaluations and interpretations of the success or failure of health messages. A media health message is a great example of a complex stimulus that possesses positive and/or negative properties that can potentially elicit diverse patterns of approach and avoidance responses. Remarkably, however, extant health communication research rarely conceptualizes or measures them as separable dimensions. Therefore, little is known about the implications of the unique and joint functions of approach and avoidance motivations on health message evaluation.

The research presented here challenges the primary proposition of current health communication research. Specifically, this research is designed to test empirically an alternative theoretical perspective regarding the motivational processing of media health messages and to examine its implications in predicting message evaluation outcomes. For this purpose, this dissertation focuses on the investigation of a bivariate model of motivational systems (Evaluative Space Model: Cacioppo & Berntson, 1994; Cacioppo & Gardner 1999; Cacioppo, Gardner, & Berntson, 1999) in which approach and avoidance motivations are hypothesized to be separable and thus compossible.

Conceptualizing Approach and Avoidance Motivations

Desire to be close to something positive and to keep away from something negative is the most primary mechanism that is inherently programmed into any organisms including human beings to ensure their survival (Zajonc, 1998). As this common knowledge describes, human motives for responding to environmental stimuli are comprised of two motivational systems—*approach motivation* and *avoidance motivation* (Hull, 1943; Elliot & Convington, 2001). The activation of these motivations is linked to the positive or negative properties (i.e., valence) of external stimuli (Lewin, 1935; Mowrer, 1960), such that the approach motivation is typically activated to move toward positively-valenced stimuli to satisfy basic needs (e.g., getting food, copulating), whereas the avoidance motivation is triggered to move away from negatively-valenced stimuli to maintain security (e.g., running away from predators/danger).

While the concept of approach-avoidance motivation is intuitively graspable, its conceptual and operational definitions have been quite diverse. For instance, in Miller's experiments (1944, 1959, 1969), the concept of approach and avoidance motivations was indicated by hungry rats' movement toward the attraction of food and away from the threat of electronic shock. This illustrates the definition of approach-avoidance motivation in terms of observable physical movement, as some labels for the approach-avoidance distinction, such as *approach-withdrawal* motivation (Schneirla, 1965), implicitly limit the scope of approach-avoidance motivation to behavioral manifestations (Elliot, 2008).

In the literature, the approach-avoidance motivation is commonly referred to an *appetitive-aversive/defensive* motivation (Elliot & Convington, 2001). Originally, the appetitive-aversive distinction was introduced by an animal psychologist (Craig, 1918) who conceptualized it as *internal* (as well as externally observable), *positive or negative states of agitation* in response to appealing or disturbing stimuli. Theorists in traditional psycho-biology have also described motivation by behavioral direction or energization of behavior, suggesting that the direction falls into only two types of motivational attributes—*appetitive* or *aversive* (Duffy, 1957; Hull, 1943; Konorski, 1948).

A class of contemporary researchers (Lang, Bradley, & Cuthbert, 1992, 1997; Bradley, Codispoti, Cuthbert, & Lang, 2001; Lang, Greenwald, Bradley, & Hamm, 1993) similarly views appetitive-aversive motivation as action tendencies/energization of behavior rather than explicit physical movement. Consistent Duffy (1957) and Konorski (1948) this group of scholars also underscored that a single energy drive (i.e., motivational state) can be demonstrated in different ways depending on a specific context. For instance, while withdrawal behavior is the typical behavioral characteristics of an aversive motivational state, a behavioral response to a negative stimulus (e.g., an enemy) can be manifested as an attack (i.e., physical approach), absconding (i.e., physical avoidance), or immobility (Lang et al., 1992). This implies that even the same explicit behavior can be driven by different underlying motivational states.

Overt behaviors by any advanced organism, including humans, are indeed the product of far more complex underlying processes. Compared to less-advanced organisms, whose observable approach-withdrawal movement is directly transferred from

its immediate behavioral readiness to positively or negatively evaluated external stimuli, a human's observable behavior may or may not be congruent with the underlying approach-avoidance motivation, and may even be overridden in the opposite direction of the initial inclination (Elliot & Church, 1997; Lang, Bradley, & Cuthbert, 1997). Indeed, in accordance with Lewin, many scholars clearly cautioned against the characterization of approach-avoidance motivation as physical movement (e.g., Davidson, 1992; Sutton & Davidson, 1997; McClelland, 1951; Miller, 1944) maintaining that approach-avoidance motivation should be understood as psychological preparedness or action tendencies (i.e., dispositional preferences for a particular action) rather just overt behavior (Elliot & Convington, 2001).

Importantly, whether approach-avoidance motivation is indicated by overt approach-withdrawal movements (Schneirla, 1965); by salivary-startle reflexive reactions (Lang, Bradley, & Cuthbert, 1990); by the activation of the left-right prefrontal cortex (Davidson, 1995); or by a positive-negative emotion/cognition (Brehm & Cohen, 1962; Cacioppo & Berntson, 1994), those characterizations should be understood as one of many levels in the approach-avoidance motivational processes which are often manifested in a hierarchical fashion (Elliot & Church, 1997; Elliot & Covington, 2001). Based on the contemporary motivation literature that conceptualizes approach-avoidance motivation as two substrates of emotion (Cacioppo & Bernston, 1994; Cacioppo & Gardner, 1999; Lang, Shin, & Lee, 2005) and as underlying drive that directs and energizes behavioral movement toward positive-negative stimuli (Eliot, 2008), the present study defines approach and avoidance motivations as valence-based (positive and

negative) psychological states underlying subsequent attitudinal/behavioral responses. Two labels indicating the positivity and negativity of motivational valence (*approach-avoidance* and *appetitive-aversive*) are used synonymously throughout the present study.

Structure of Approach and Avoidance Motivations

Reciprocal Structuralization of Motivational Valence Systems: Dual-Dimensional Models

While it hasn't been explicitly mentioned, the one-sided focus on either approach or avoidance motivation and the wide use of bipolar measures in previous health communication research are based on the bipolar structuralization of two motivational valence systems (i.e., positivity/approach motivation and negativity/avoidance motivations) where the increase in positivity is equivalent to the decrease in the negativity. This idea is largely grounded on traditional two-dimensional models of emotion (Bradley, Greenwald, Petry, & Lang, 1992; Bradley & Lang, 2000; Feldman Barrett & Russell, 1999; Lang, 1979; Lang, Bradley, & Cuthbert, 1990; Larsen & Diener, 1992; Russell, 1980, 2003), which posit that emotional space is comprised of two separate, bipolar dimensions, including valence/pleasure and arousal/activation.

The valence dimension is defined as the hedonic tone of the emotional experience, ranging from pleasant to unpleasant, whereas arousal indicates a sense of mobilization or energy (i.e., the level of excitement), ranging from activation/arousal to deactivation/sleep (Russell, 1980; Feldman Barrett & Russell, 1999). The core postulation of the dual-dimensional model of emotion is any affective experience can be

specified on an affective space consisting of the independent valence - arousal dimensions. For instance, in their influential Circumplex Model of Affect, Russell and colleagues (Russell, 1980; Russell & Carroll, 1999 a, b) proposed that emotions fall in a circular order around the perimeter of a space constructed by two orthogonal valence - arousal dimensions. Studies reporting only weak to moderate associations between felt arousal and the intensity of a valence response provided evidence on the independence of the two dimensions, contending that the level of activation (arousal) is not reducible to the magnitude of a valenced affective response (Yik, Russell, & Barrett, 1999; Ito, Cacioppo, & Lang, 1998). Russell and Carroll later refined the valence of emotional structure as polar opposites on the bipolar continuum, which should be mutually exclusive. In other words, the theoretical correlation between the experience of negative and positive emotions should approach −1 (Russell & Carroll, 1999a). Similarly, another camp of scholars also contends that positive and negative emotions are at opposite ends of a continuum of emotional valence, and, therefore, the two should be reciprocally activated (i.e., negatively correlated) (e.g., Bradley & Lang, 1994; Lang, Bradley, & Cuthbert, 1992). This bipolar conceptualization of the valence of emotions is reflected in bipolar measures utilized by this group of scholars, such as the Self-Assessment Manikin (SAM) (Bradley & Lang, 1994), where positive and negative emotions are the end property of an one-dimensional bipolar continuum. To simplify, under these two-dimensional models, people cannot experience positive and negative feelings simultaneously (Russell & Carroll, 1999a).

Controversies over the structure of emotion-based motivation in the literature are less about the first proposition of the traditional dimensional models—the independence of the valence and arousal of emotional structure – but more about the second assumption that the two substrates of valence (i.e., positive and negative emotions) are located in a bipolar, uni-dimensional continuum and are, therefore, always reciprocally activated. Across different fields of studies, there have been scholars who were not satisfied with the bipolar conceptualization of the valence dimension and bipolar measures that reflect this theoretical view. In early discussions of fundamental human motivations, for instance, Lewin (1951) told the story of a child at a beach whose toy floated in the surf. The anecdote highlights the possibility of a situation where the child is frozen due to an approach-avoidance conflict, which refers to the simultaneous occurrence of approach motivation (i.e., the child's desire to move toward the ocean to retrieve the toy) and avoidance motivation (i.e., the child's desire to move away from the danger of the surf).

Even early behavioral theorists challenged the reciprocity of approach and avoidance motivations by demonstrating that the behavioral approach and withdrawal could be thought of as the function of two separable motivational substrates: approach and avoidance tendencies (Dollard & Miller, 1950; Miller, 1951, 1961). Miller and colleagues' works demonstrated that the strength of both approach and avoidance tendencies increased as the distance from the goal decreased (i.e., as rats neared the goal), and revealed situations where animals were stuck between the co-activated/mixed basic motivations at a particular crossover point until one motivation dominates the other[1].

Their findings suggest that not only are approach and avoidance tendencies separable in their influence on approach-withdrawal behavior, but the same cue (e.g., a goal, an attitudinal object, an event, etc.) could produce a co-activation of positive and negative motivational systems.

Similar questions have also been raised in the field of attitude research (e.g., Komorita & Bass, 1967; Wiggins & Fishbein, 1969), in opposition to the widely accepted one dimensional bipolarity in the structure of an attitude (Allport, 1935). In particular, the skepticism about popular bipolar measures (e.g., semantic differential scale, Osgood, Suci, & Tannenbaum, 1957) was raised in the context of the attempt to distinguish ambivalence from indifference to explain attitudinal neutrality (i.e., the middle point on a bipolar measure of attitude) (Kaplan, 1972). For example, two explanations may be possible for a middle category on a bipolar continuum (e.g., a 'zero' score on a bipolar scale with polar adjectives at the each end ranging from -3 to 3): the neutrality may indicate indifference (i.e., feeling neither positive nor negative) but an alternative explanation can be ambivalence (i.e., feeling both positive and negative equally). Indeed, applying the reasoning from Miller's conflict theory, several attitude researchers argued that mixed feelings in response to the same object should be accounted for in the explanation of attitude, and the greater and more equal the opposite motivational tendencies (approach and avoidance motivations), the higher the degree of ambivalence (e.g., Brown & Farber,1951; Scott, 1966).

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[1] Miller (1951) illustrated the graphic representation of an approach-avoidance motivational conflict and distinctive characteristics of the two motivations. While both approach and avoidance tendencies increase, the slope for the increase in avoidance tendencies is steeper than the slope for the increase in approach tendencies. Cacioppo & Berntson (1994) later labeled this difference in the activations' functions of approach and avoidance motivations as *positivity offset* and *negativity bias*, respectively.

Emotion researchers who are in opposition to the bipolar conceptualization of emotion also maintain that some positive and negative moods and emotions are not mutually exclusive and can independently occur (e.g., Bradburn, 1969; Diener & Emmons, 1984; Watson & Tellegen, 1985; Watson, Clark, & Tellegen, 1988). Particularly, Watson & Tellegen's (1985) dimensional model of emotion was introduced against the early dimensional models of emotion (e.g., Russell, 1980). The model was similar in that it also structured emotion as two dimensions in a circumplex, but differed in that one dimension is ”positive affect” (PA) and the other dimension is ”negative affect” (NA). In other words, compared to the early dimensional models of emotion which considered arousal and bipolar valence the two independent dimensions of emotional structure, Watson & Tellegan's (1985) model incorporates the intensity of emotional activation into emotional valence, resulting in two separate, potentially independent valence dimensions: *positive affect dimension* ranging from lethargy to enthusiastic and happy (highly arousing positive affect), and the *negative affect dimension* ranging from calmness to anger or fear (highly arousing negative affect). Based on this conceptual model, Watson and colleagues (1988) developed an alternative measure of emotional response to traditional bipolar measures, called Positive and Negative Affect Schedule (PANAS). This measure consists of ten unipolar measurement items for each PA and NA with the anchors 1 (very slightly or not at all) and 5 (extremely). Against the reciprocity of positive and negative emotions hypothesized in two-dimensional (arousal-valence) dimensional models, Watson and Tellegan (1999) hypothesize that happiness and sadness can occur independently (i.e., weak correlations

between positive and negative emotions substantially far from -1) and they are only mutually exclusive when people are maximally happy or maximally sad. Although methodological issues are important to consider[2], numerous studies have been conducted to test the reliability of the PANAS since Watson and colleagues' original studies, and provided subsequent evidence to the possibility of independent occurrence of positive and negative affects (Goldstein & Strube, 1994; Gray & Watson, 2007; Huebner& Dew, 1995).

Bivariate Structuralization of Approach-Avoidance Motivation: the Evaluative Space Model

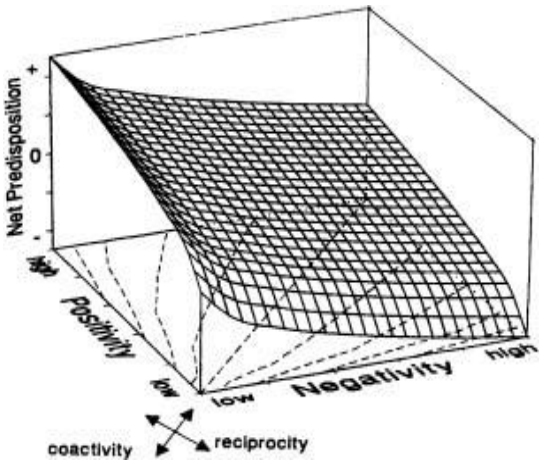
Building on the pioneering work demonstrating the independence and coactivation of emotional/attitudinal/motivational systems (e.g., Bradburn, 1969; Kaplan, 1972; Miller, 1951, 1959, 1960; Watson & Tellegen, 1985), the Evaluative Space Model (ESM) (Cacioppo & Bertson,1994) was proposed as a general model of affect and motivational space. Focusing on basic human motivations underlying the experience of emotion, the ESM posits that an evaluative experience represents the integration of two separable substrates of the motivational valence system—positivity (i.e., approach/appetitive motivation) and negativity (i.e., avoidance/aversive motivation)—and these two separate systems provide the basis of positive and negative feelings

[2] The observed weak correlations measured by PANAS have been criticized by advocates of the two-dimensional model of affect, mostly due to the quasi-independent nature of the two set of measures (Thomson, 2007). In other words, adjectives assessing PA and NA are not precisely selected from the opposite ends of Russell's bipolar valence dimension, and thus the low correlations between PA and NA do not necessarily provide evidence against the bipolarity of the valence dimension (Feldman, Barrett & Russell, 1998, 1999).

(Cacioppo, Gardner, & Berntson, 1999; Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009).

As this model was developed by embracing the conflicting views of emotional structure in the field (i.e., reciprocity versus coactivity), Cacioppo & Berntson (1994) first underscored that the ESM shares important principles with existing models of affect. The first principle, Principle of Evaluative Activation, posits that an attitude is a joint function of positively and negatively valenced motivational activation to a stimulus. The second principle, Principle of Opposing Evaluative Actions, states that positively and negatively valenced motivational activations generally have antagonistic effects on an attitude. The conventional principle that they challenge in their bivariate model was the third principle, Principle of Reciprocal Evaluative Activation, which assumes that positively and negatively valent motivational activations that determine an attitude toward a stimulus are reciprocally controlled (Cacioppo & Berntson, 1994, p. 401; Cacioppo, Gardner, & Berntson, 1997). In contrast to traditional dimensional models, the ESM posits the separability of motivational substrates, allowing the possibility that people can experience any pattern of happiness and sadness along an evaluative space, as illustrated in Figure 1.

Figure 1. The evaluative space model (ESM)



Source: "Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates," by J. T. Cacioppo and G. G. Berntson, 1994, *Psychological Bulletin, 115 (3),* p. 412.

Specifically, Cacioppo and colleagues argued that the reciprocal effects do exist, but the positively and negatively valenced motivations can be activated in different ways— (1) reciprocally (i.e., mutually exclusive activation) when activation in one system increases and activation in the other system decreases; (2) uncoupled (i.e., functionally independent, singular activation) when activation in one system increases or decreases and the other system is not affected; or (3) non-reciprocally when activation increases (i.e., co-activation) or decreases (i.e., co-inhibition) in both systems at the same time (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1999).

There is now good evidence that different patterns of motivational activations can coexist. In a study that examined underlying motives of attitudes toward college roommates, Cacioppo and colleagues (1996) found that participants' positive feelings about their roommates were not negatively correlated with the activation of negative emotions, supporting the functional independence of motivational systems. Researchers

also found circumstances in which a neutral rating on a bipolar scale does not simply indicate no activation or indifference, but is the result of the simultaneous activation of positive and negative motivational systems (ambivalence/mixed feeling) (e.g., Mellers, Schwartz, Ho, & Ritov, 1997). The hypothesized multiple modes of motivational activation were also found (e.g., Ito, Cacioppo, & Lang, 1998; Larsen, McGraw, & Cacioppo, 2001). For example, Larsen and colleagues (2001) investigated whether positive and negative motivational reactions to the same object can simultaneously occur under different situations. The result showed that only 10 percent of participants felt both happy and sad before watching a film, whereas almost half of the participants felt both happy and sad after watching the film. Ito and colleagues (1998) also confirmed that multiple modes of evaluative activation, including reciprocal and uncoupled activation, can exist in response to positively- or negatively-valenced pictures. More recent studies also demonstrated the evidence of the seprarability and coactivation of the positivity and negativity of motivational valence in response to bittersweet film clips (Larsen & McGraw, 2011; Stanley & Meyer, 2009). Although these and many other studies (e.g., Feldman, Barrett & Russell, 1998; Green, Goldman, & Salovey, 1993; Remington, Fabrigar, & Visser, 2000) also reported the bipolarity of positive and negative emotion, these findings are compatible with the bivariate perspective of ESM, suggesting that the bipolar structure of motivational processes should be tested rather than simply assumed.

Psychological research is not the only source of evidence supporting the separability of approach-avoidance motivational activation. In particular, examining the representation of motivational systems in the brain allows us to understand the complex

motivational process from a different angle. The basic assumption in the neural approach to the study of motivational processing is that approach and avoidance tendencies are managed by different structures in brain regions (Carver & Harmon-Jones, 2009). For instance, it has been reported that approach motivation-related behaviors are linked to activation of the left prefrontal cortex, whereas avoidance motivation-related behaviors are linked to activation of the right prefrontal cortex (Sutton & Davidson, 1997; Davidson, 1998). Also, the amygdala has been widely considered a site in the brain involved in the acquisition of negatively valenced stimuli and the expression of aversive motivation (Irwin et al., 1996; LeDoux, 1995). The ventral tegmental area of the midbrain to the nucleus, which is known as the pathway of dopamine, has represented the activation of appetitive motivation (Hoebel, Rada, Mark, & Pothos, 1999). Although one should not rush to make an impetuous conclusion about these findings due to a number of conflicting findings (LeDoux, 1995), the idea that approach and avoidance systems involve partially distinct neural substrates provides evidence on the possibility that the two motivational valence systems can be non-reciprocally activated (Cacioppo & Berntson, 1994; Larsen, McGraw, & Cacioppo, 2001).

Overview of the Present Dissertation

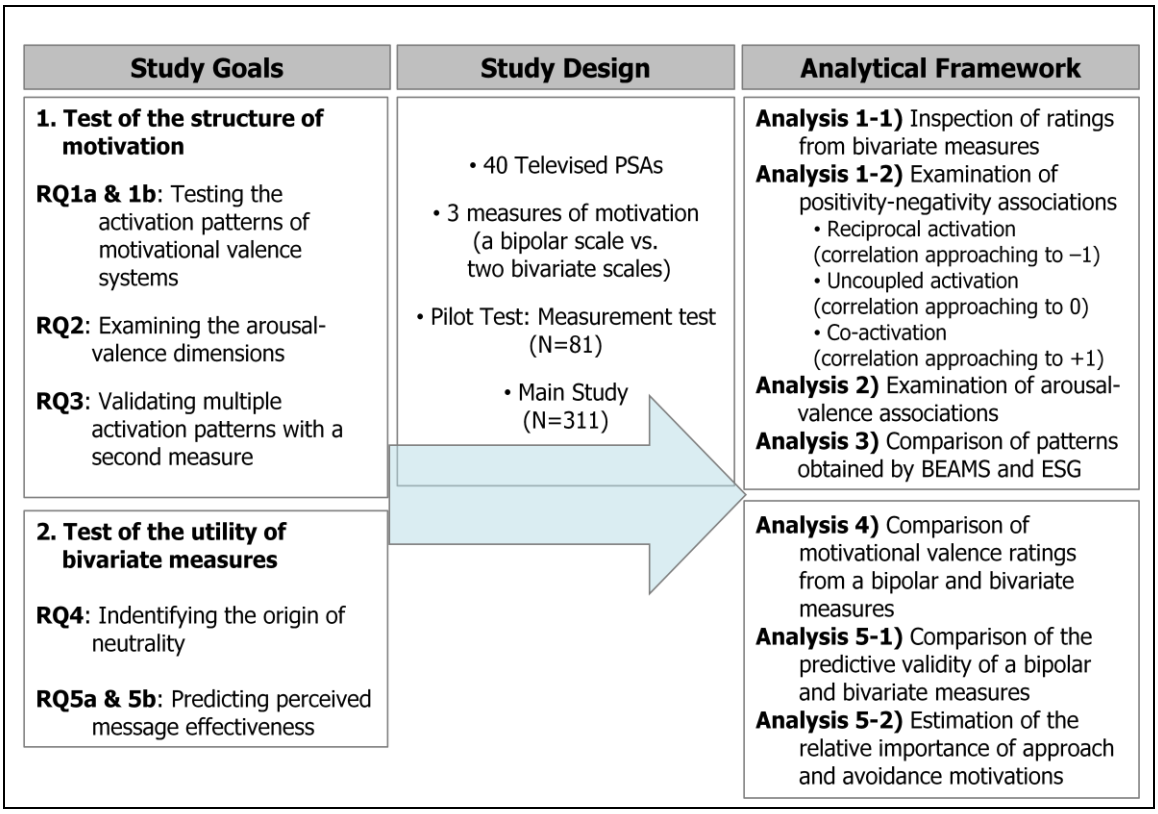
As aforementioned, the emotional-based motivational structure has been understood in different ways, each approach with its own conceptual model, measurement, and supporting evidence. What is surprising and unfortunate is the scarcity of attempts to incorporate this rich stream of literature to shed light on the motivational

processing mechanism of health messages in the media. In the present dissertation, I argue that current health communication research and practice can benefit from expanding the prevalent bipolar view to include the separability of approach-avoidance motivations and the possibility of multiple modes of motivational activations proposed by the bivariate model of evaluative space. In particular, compared to the prior dimensional models concerning whether positivity and negativity are bipolar (Russell, 1980) or independent (Watson & Tellegen, 1985), the bivariate model (ESM) is more capable of identifying the unique or joint influence of the approach-avoidance motivational activations on subsequent persuasive outcomes (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997).

Despite the great potential of utilizing the bivariate framework in the design and evaluation of persuasive health messages, conceptualizing and measuring the two motivations as separable dimensions has been scarce in contemporary health communication research, even when researchers are interested in examining underlying motivational processing elicited by complex health messages. In response, the objective of the present study is to take a first step in examining the benefits of expanding the prevalent bipolar view of the valence of emotion to a bivalent view of the structure of motivation. The first set of research questions (RQ1a and 1b – RQ3), therefore, are suggested to demonstrate empirical evidence of how individuals respond to health messages with diverse patterns of motivational activation. As the next step to demonstrate the virtue of applying the bivariate idea, this study investigates how hypothesizing approach and avoidance motivations as two distinct motivational

substrates help explain the ineffectiveness of health messages (i.e., the lack of change) found in the previous bipolar evaluation framework (RQ4) and enhance the prediction of subsequent message evaluation outcomes (RQ5a and 5b). Addressing these questions will develop a more comprehensive picture of how messages are processed, by considering the two equally important human motives. The Overview of the present research is illustrated in Figure 2.

Figure 2. *Overview of the Present Study*



CHAPTER II. PILOT TESTS: SELECTION OF BIVARIATE MEASURES OF MOTIVATIONAL ACTIVATION

Introduction

Difficulties in answering the basic question of whether people can develop happiness and sadness simultaneously in part stem from the complexity of selecting sophisticated measures of emotion (Kaplan, 1972; Larsen, McGraw, & Cacioppo, 2001; Larsen & McGraw, 2011). Similarly, a valid measure that can separately assess the activation of approach and avoidance motivations may be the pre-condition of investigating the occurrence of diverse activation patterns. A pilot study was conducted to select a valid set of unipolar measures of motivation to be included in the main study for its comparison with a traditional bipolar measure.

In the pilot test, I focused on examining the convergence of two types of existing unipolar measures that have the capacity to separately evaluate the positivity and negativity of motivational valence systems: the bivariate evaluation and ambivalence measures (BEAMs; Cacioppo, Gardner, & Berntson, 1997) and the evaluative space grid (ESG; Larsen, Norris, McGraw, Hawkley & Cacioppo, 2009). Specifically, the following two conditions need to be met for the convergence. First, the mean ratings of positivity and negativity obtained from the two measures should correspond to each other. Second, the activation patterns of the positivity and negativity of motivation, which are determined from the calculated correlations between the two substrates for each ad (See Ito, Cacioppo, & Lang, 1998), should also be compatible.

Method

Measures

BEAMs. While the PANAS (Watson, Clark, & Tellegen, 1988) has been a useful measure to separately assess positive and negative affect (i.e., PA and NA), scholars pointed out that the subscales of PA and NA are incompatible due to the difference in their semantic and arousal level (Cacioppo, Gardner, and Berntson, 1997; Feldman, Barrett & Russell, 1998). In response, Cacioppo and colleagues (1996, 1997) developed BEAMs, a set of unipolar self-report scales to measure separate dimensions of an evaluative space. The BEAMs contains two forms of positive and negative evaluation dimensions, selected from sixteen antonym pairs, each with eight adjectives (Table 2)[3].

Table 1. *Bivariate Evaluations and Ambivalence Measures(BEAMs)*

Form A		**Form B**	
Positivity	*Negativity*	*Positivity*	*Negativity*
Favorable	Undesirable	Desirable	Unfavorable
Appealing	Negative	Positive	Unappealing
Pleasant	Unlikable	Likable	Unpleasant
Agreeable	Unhappy	Happy	Disagreeable
Approving	Opposing	Supporting	Disapproving
Rewarding	Bad	Good	Punishing
Delighted	Unattractive	Attractive	Distressed
Comfortable	Unsatisfying	Satisfying	Uncomfortable

Source: "Beyond bipolar conceptualizations and measures: the case of attitudes and evaluative apace," by J. T. Cacioppo, W. L. Gardner, and G. G. Berntson, 1997, *Personality and Social Psychology Review,*1(1), 3-25.

[3] The original BEAMs include items to measure ambivalence as well as scales to measure positivity and negativity. Items for ambivalence (i.e., muddled, divided, tense, contradictory, jumbled, and conflicted) were developed to indicate undecided states in response to inconsistent or contradictory information. Because the coactivity of motivational valence systems will be determined by examining separate positivity and negativity scores, rather than directly asking whether a participant feels contradictory, those items were not included in the present study.

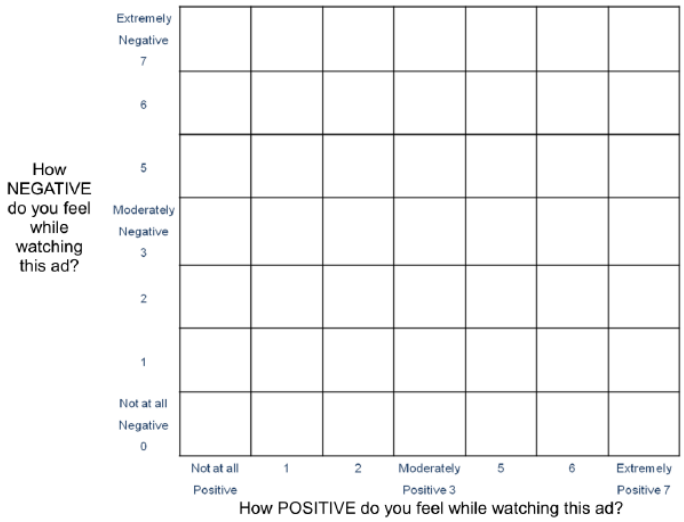
Selected adjectives for the pilot test were (1) positivity measure items: delighted, pleasant, happy, approving, satisfied, good, and appealing and (2) negativity measure items: unlikeable, unpleasant, unattractive, disapproving, distressed, disagreeable, and uncomfortable. The inter-item reliability for both dimensions was satisfactory (positivity: $\alpha = .93$; negativity: $\alpha = .95$). Participants who were assigned to rate on BEAMs scale were asked to indicate the extent to which each adjective was a good description of their positive/negative motivational reactions to a given ad on a 7-point scale, anchored by 1 (very slightly/not at all) and 7 (extremely). To avoid carryover effects, the use of the exact antonym adjective pair (e.g. happy/unhappy) was minimized. To further avoid carryover effects, the presentation order of the positivity and negativity scales was counter-balanced and participants completed the first rating scale before being instructed to complete about the second scale. .

ESG. The time for rating on multi-item scales can be burdensome for the participants, especially when they are asked to evaluate large numbers of stimuli. As an alternative way to separately assess the substrates of an evaluative system, Larsen and colleagues (2009) developed the evaluative space grid (ESG; see Figure 3), as a single-item measure of positivity and negativity. In contrast to BEAMs' unipolar positivity and negativity scales consisting of multiple adjectives, ESG allows participants to rate the positivity and negativity scores at the same time, and thus the activation patterns of approach and avoidance motivations can be easily identified.

The convergent validity with other established unipolar measures has been tested by Larsen et al. (2009), but it has not been tested in the context of examining

motivational reactions to televised health messages. The present pilot study modified ESG into a computerized questionnaire. Participants assigned to use this scale were asked to indicate how positive (1= not at all, 7 = extremely) and negative (1= not at all, 7 = extremely) they felt along the x-axis (positivity) and y-axis (negativity) using a mouse to select one of the grid's 49 cells.

Figure 3. *The Evaluative Space Grid*



Pilot Study Materials

Six 20- to 30-second antidrug ads were purposely selected from an existing pool of 79 antidrug ads on the basis of their arousal and bipolar valence scores obtained from a previous study (Yzer, Vohs, Luciana, Cuthbert, & MacDonald III, 2011). All six ads address marijuana use. Each ad was selected to have different combinations of arousal and valence to ensure the inclusion of a wide range of ad contents across the entire evaluative space. For example, one of the ads was determined to have high arousal and negative valence, whereas another was determined to have high arousal and positive valence. The arousal and bipolar valence scores for the six stimuli on a seven-point scale

are described in Table 2. The order of presentation of the ads was randomized. Therefore, some participants watched a non-arousing positive ad first, followed by an arousing negative ad, whereas others watched an arousing negative ad first, followed by a non-arousing neutral ad.

Table 2.

Arousal and Valence Scores for Pilot Test Stimuli

Ad #	Arousal	Valence
Ad 1	5.32	2.58
Ad 2	4.78	3.76
Ad 3	4.36	4.80
Ad 4	3.17	3.89
Ad 5	3.56	3.52
Ad 6	3.48	3.16

Participants and Procedure

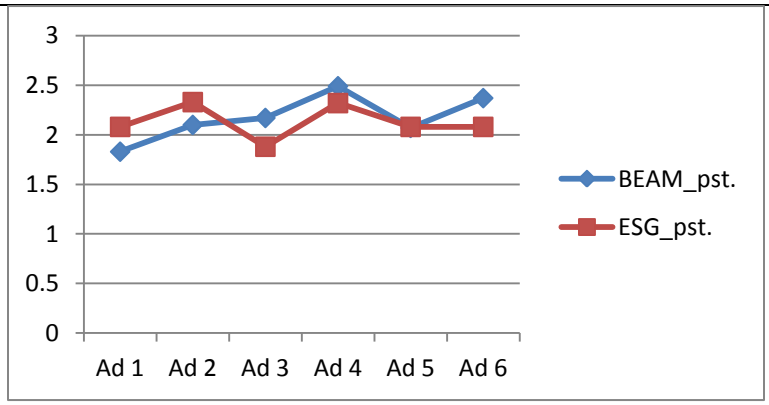
These six ads were rated by 81 undergraduate students (M_{age}=19.89 years; 64.2% female) on the following dimensions that represent different conceptualizations of emotional structure: arousal, bipolar valence, and the positivity and negativity of valence (with either BEAMS or ESG). When participants arrived at a research lab, they received a brief description of the study and a consent form. After filling out the consent form, participants were seated at one of the cubicles in the computer lab, where they viewed six antidrug ads. Each session began with an introduction screen explaining that a series of ads would be presented. Due to the relative complexity of using ESG, participants assigned to the ESG condition had a practice session with the scale before they actually watched and rated study videos. After receiving practice for the rating method, the subject was instructed to get ready three seconds before the first ad played on the screen.

Immediately after the presentation of each ad, a rating screen appeared and the subject was asked to rate on the arousal measure and one of the motivation measures depending on the assigned measurement condition. After the ratings for one ad were completed, the instruction for the next ad and "get ready" sign appeared on the screen. This series of events continued until all six ads were viewed and rated. At the end of this session, the subject was debriefed, thanked, and given course credit.

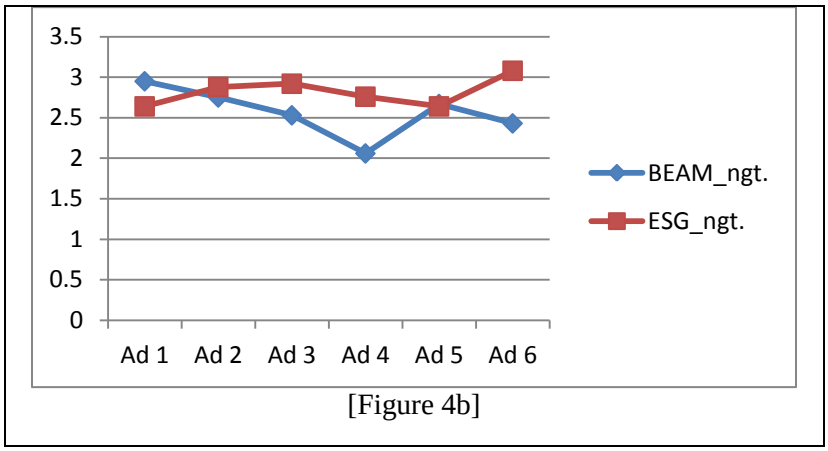
Results

The results showed that positivity and negativity ratings can differ as a function of the type of measure, indicating that the validity of extant motivational measures requires further examination. First, whereas the graphic comparison of positivity ratings showed a fairly similar pattern between the two measures (Figure 4a), the negativity ratings depicted a distinctive pattern (Figure 4b).

Figure 4. *Comparison of Positivity and Negativity Ratings for Six Pilot Ads*



[Figure 4a]



[Figure 4b]

Notes. BEAMs_pst/ESG_pst: positivity scores obtained by BEAMs/ESG; BEAMs_ngt: negativity scores obtained by BEAMs/ESG

In addition, the motivational activation patterns determined by positivity-negativity correlation scores obtained from the two measures corresponded well for some ads (e.g., ad 1: BEAMS_$r_{P,N}$ = –0.59, ESG_$r_{P,N}$ = –0.59), but not for other ads (e.g., ad 4: BEAMS_$r_{P,N}$ = –0.63, ESG_$r_{P,N}$ = –32) (see the fifth and sixth columns in Table 3). Because of these findings I decided to use both BEAMs and ESG in the main study, as it is not possible to derive from the ratings which measure might be superior.

Table 3.

Comparison of Ratings Obtained by BEAMS and ESG for Each Ad

Ad #	BEAMS_pst	ESG_pst	BEAMS_ngt	ESG_ngt	BEAMS_$r_{P,N}$	ESG_$r_{P,N}$
Ad 1	1.83	2.08	2.95	2.64	–0.59	–0.59
Ad 2	2.10	2.33	2.75	2.88	–0.76	–0.56
Ad 3	2.17	1.88	2.53	2.92	–0.68	–0.59
Ad 4	2.49	2.32	2.06	2.76	–0.63	–0.32
Ad 5	2.07	2.08	2.67	2.64	–0.63	–0.43
Ad 6	2.37	2.08	2.43	3.08	–0.64	–0.52

Notes: BEAMS_$r_{P,N}$: correlation between positivity and negativity obtained by BEAMS; ESG_$r_{P,N}$: correlation between positivity and negativity obtained by ESG

CHAPTER III. TEST OF THE STURCTURE OF MOTIVATIONAL SYSTEMS

Introduction

Emotion scholars have focused on mapping the structure of emotion based on the idea that underlying human motivations give rise to the experience of positive and negative emotion. In traditional emotion models, emotions are thought to be placed along a two-dimensional space consisting of a bipolar valence continuum and an arousal continuum. This view has long been the dominant theoretical and methodological approach in both emotion and attitude research (Bradley, Greenwald, Petry, & Lang, 1992; Bradley & Lang, 2000; Feldman Barrett & Russell, 1998; Osgood, Suci, & Tannenbaum 1957; Russell, 1980).

This theoretical view was enriched by work of Cacioppo and his colleagues (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson 1999), who proposed an evaluative space model (ESM) based on the view that the structure of valence, which previously was hypothesized as a bipolar continuum, can be better understood as a bivariate evaluative space in which the positivity and negativity of the valence system are distinct and thus each of them can be independently and simultaneously activated.

Before highlighting conflicting perspectives regarding the conceptions of emotion-based motivational systems between the two-dimensional emotion model (i.e., arousal-valence model) and the bivariate model (i.e., ESM), it is important to note two important concepts that they have in common. First, the recognition of the separability of positive and negative motivational substrates in the bivariate model of evaluative space

does not deny the core arguments of conventional dimensional models. As explicitly mentioned by Cacioppo and Berntson (1994), the ESM incorporated the ideas that approach and avoidance motivational systems have antagonistic effects, and they are often reciprocally activated. Second, the controversies over the structure of emotion-based motivation in the literature are less about the independence of arousal-valence dimensions, which has been the core notion of traditional dual-dimension models. The majority of scholars from both sides of the debate agree that the valence dimension signifies which motivational system is active (i.e., direction of motivational activation) whereas the arousal dimension indicates how strongly a motivational reaction is induced (i.e., degree of motivational activation; Bradley, Codispoti, Cuthbert, & Lang, 2001; Elliot, 2008; Ito, Cacioppo, & Lang, 1998; Lang, Shin & Lee, 2005).

What differentiates the ESM from past models is its central assumption about the potential of non-reciprocal activations of the positivity and negativity of the valence dimension. In other words, according to ESM there are occasions where the same stimuli can induce both approach and avoidance reactions, which implies that a reduction in negative motivation does not necessarily mean that positive motivation increases by the same degree and vice versa (Larsen, Hemenover, Norris, & Cacioppo, 2003). Drawing on the core ESM postulations, the present study argues that a health message can induce both intended responses, e.g., approach motivation, and unintended responses, e.g., avoidance motivation, and that this possibility has important implications for health communication research and practice. The purpose of this study is an empirical test of this theoretical idea in the context of televised antidrug campaign messages.

Research Questions

Test of the Bivariate Structure of Motivational Systems

There have been substantial efforts to test the independence of approach-avoidance motivational systems across diverse fields of research. Notably, in 1998, Ito, Cacioppo, and Lang examined the possibility of multiple modes of evaluative activation using a set of images included in the International Affective Picture System (IAPS; see Lang, Bradley, and Cuthbert, 1997). IAPS is comprised of still images that vary in positive and negative valence, and in arousal level (e.g., images of a baby, a snake, a car crash, or explicit sexual imagery). Ito and colleagues demonstrated that the same stimulus (in this case a picture) can elicit diverse patterns of evaluative responses by examining correlations between positivity and negativity ratings obtained by BEAMs. These response patterns include reciprocal positive and negative evaluations, uncoupled positivity, and uncoupled negativity. This diversity of responses held even when the picture was chosen from a pool of images that had been evaluated positively or negatively based on a bipolar assessment. Such results indicate that the bipolar structure of motivational processes and the utility of bipolar measures should be tested rather than simply assumed.

Ito et al.'s (1998) study provided important empirical evidence for multiple patterns of motivational activation. Note, however, that those patterns were obtained by having participants view a set of simple still images, i.e., pleasant or unpleasant pictures. Ito and colleagues observed that a study that employs more emotionally complex stimuli is necessary to further validate the nonreciprocal activation patterns of appetitive and

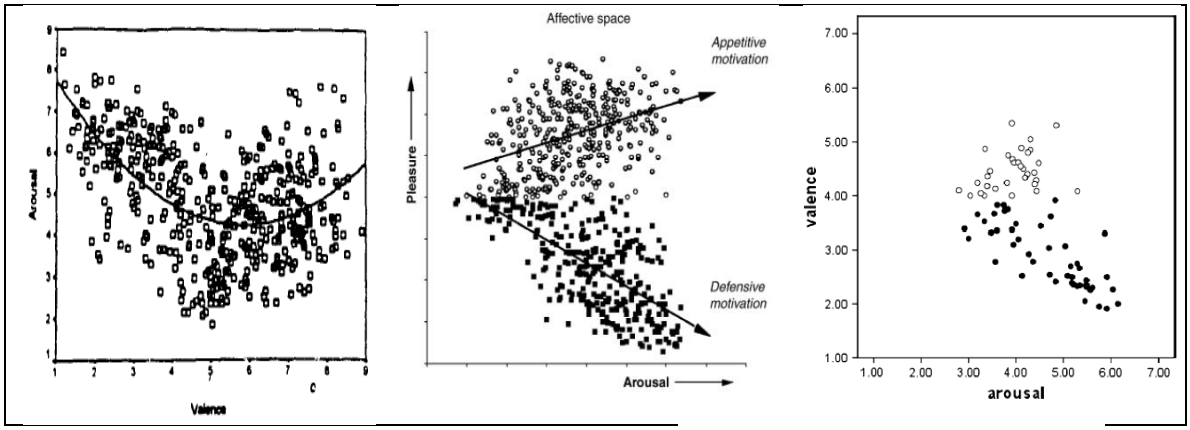
aversive motivations. In response to the above implications, the present study tests the generalizability of Ito and colleagues' findings by examining motivational activation patterns observed in response to complex, ant-drug video messages.) It is conceivable that because a televised message, a popular tool for disseminating antidrug messages, is a complex configuration of both visual and auditory attributes, it may have greater potential for producing diverse patterns of appetitive-aversive motivational responses compared to the simple pictures examined in the study of Ito et al. (1998). Modeled on the theoretical and methodological framework that influenced or examined the bivariate model of evaluative space (Cacioppo & Berntson, 1994; Ito, Cacioppo, & Lang, 1998), the following research questions are suggested:

> **RQ1a**: Are there antidrug ads that evoke approach and avoidance reactions non-reciprocally (independently or simultaneously)?
>
> **RQ1b**: What are the associations between approach and avoidance reactions in response to each ad? Do any ads demonstrate a positive or weak correlation that indicates simultaneous or independent relationship between the two antagonistic motivational reactions?

In examining the structure of motivation, we should recognize that arousal is another primary dimension of traditional dual-dimensional models of emotion. The ESM agrees that arousal and valence are distinct and that both are necessary to understand the structure of emotion (Bradley & Lang, 1994; Feldman Barrett & Russell, 1999; Lang, Bradley, & Cuthbert, 1992; Russell, 1980). Notably, studies concerning the arousal-valence relationship reveal a curvilinear or boomerang-shaped pattern of valence and

arousal ratings on the two-dimensional affective space, such that stimuli producing high or low ratings on the bipolar valence dimension tend to demonstrate higher levels of arousal, whereas stimuli falling more toward the midpoint of the valence dimension tend to exhibit lower levels of arousal (Bradley, Codispoti, Cuthbert, & Lang, 2001; Bradley, 2009; Yzer, Vohs, Luciana, Cuthbert, & MacDonald III, 2011).

Figure 5. *Examples of Arousal – Valence Associations Found in Previous Studies*



Notes. (from the leftmost to the rightmost) Adopted from "Eliciting affect using the International Affective Picture System: Trajectories through evaluative space" by Ito, T. A., Cacioppo, J. T., & Lang, P. J., 1998, *Personality and Social Psychology Bulletin*, *24*(8), 855-879.; "Emotion and motivation I: defensive and appetitive reactions in picture processing" by Bradley, M. M., Codispoti, M., Cuthbert, B. N., & Lang, P. J., 2001, *Emotion*, *1*(3), 276.; "Affective antecedents of the perceived effectiveness of antidrug advertisements: An analysis of adolescents' momentary and retrospective evaluations" by Yzer, M. C., Vohs, K. D., Luciana, M., Cuthbert, B. N., & MacDonald III, A. W., 2011, *Prevention Science*, *12*(3), 278-288.

As Figure 5 shows, the distribution of pleasure-arousal ratings exhibit weak negative associations when a linear regression line is forced (e.g., $r = -.40$ in the leftmost graph adopted from Ito, Cacioppo, & Lang, 1998). But when regression lines are depicted separately in each plot for pleasant stimuli (open dots) and unpleasant stimuli (filled dots), increased arousal ratings were associated with increased activation of both positivity and negativity. This finding is particularly pertinent to the present study given

that the distribution of the plots depicted in Figure 1 is assumed to reflect underlying appetitive and aversive motivational systems. The '<' shaped distribution patterns indicate that the two substrates of motivation can be uniquely activated by highly arousing, strongly valenced stimuli, regardless of the direction of the valence (Bradley, 2009; Yzer, Vohs, Luciana, Cuthbert, & MacDonald III, 2011).

Despite the importance of these studies in demonstrating that the appetitive and defensive motivational systems potentially have separate activation and processing mechanisms, they all measure the valence dimension with a bipolar scale, and later split stimuli into two groups by the midpoint of obtained valence ratings. While helpful, this arbitrary separation remains insensitive to associations between the activation of arousal and valence systems when positivity and negativity simultaneously occur. In other words, the categorization of stimuli into either a positive or a negative group implicitly presumes that appetitive reactions (indicated by ratings falling on the upper side from the midpoint of the bipolar scale) are in a reciprocal relationship with aversive reactions (indicated by ratings falling on the lower side from the midpoint of the bipolar scale).

If one applies the rule of bivariate activation to the investigation of the relationship between arousal and valence systems, one can find a similar pattern to the previous findings such that an upward-sloping vector can be found for both a positivity–arousal and a negativity–arousal association. Importantly, however, it is also possible that two separately obtained distributions of arousal-valence ratings, one for positivity and the other for negativity, might reveal idiosyncratic patterns of arousal-valence associations. If the latter case is found, the result would not only add evidence to the established

hypothesis on the independence of arousal and valence, but also provide another rationale to embrace the bivariate hypothesis. Hence the third research question of the present study is:

> **RQ2**. How are valence systems of motivation associated with arousal? Should the arousal-valence association obtained from a bipolar valence measure differ from the association obtained by separate positivity and negativity measures?

The purpose of utilizing diverse analytical approaches to examine the pattern of motivational activation is to add confidence in the study findings regarding the structure of motivation. To further enhance the reliability of the findings, the main study employed two different types of bivariate, unipolar measures, including BEAMs and ESG.

Scholars have pointed out that one of the difficulties in demonstrating the diverse patterns of motivational reactions lies in the lack of sophisticated measures (Larsen, McGraw, & Cacioppo, 2001). In accordance, the result of the pilot study reported in the previous chapter demonstrated that different types of bivariate measures often produced non-corresponding patterns in producing the positivity and negativity ratings and in determining the activation pattern of each ad. However, the sample size of the pilot test was too small to conclude that the two measures do not converge (the unit of analyses was ads and only 6 ads were tested) leading to the inclusion of both measures in this main study. In particular, I focus on examining whether ratings obtained from the two measures can demonstrate similar findings that lead to a certain conclusion about the structure of motivational valence systems. Following Ito et al. (1998), the BEAMs are the main tools to investigate the activation of approach-avoidance motivations and their

relationships to determine their activation patterns. Additionally, the ESM was employed as an alternative measure (consistent or contradictory) to explain the structure of motivational systems:

> **RQ3**: Can different types of motivational measures demonstrate analogous findings with regard to the possibility of non-reciprocal activations that are tested in the three analyses above?

Test of the Utility of Bivariate Conceptualization of Motivational Valence Systems

Ultimately, the investigation of the potential of diverse patterns in motivational activation may be reduced to this question: What is the advantage of conceptualizing motivational valence systems as a bivalent space rather than as a one-dimensional bipolar continuum? More practically speaking, can using bivariate measures have more merit than the bipolar measures that have been prevalent in the field?

There are reasons to believe in the bivariate approach. The first prominent rationale for allowing several modes of motivational activation stems from the insensitivity of a conventional bipolar measure to identify the source of neutrality (a lack of change). When measured on a bipolar scale, responses from both truly unmotivated respondents (inactivation or indifference) and those in motivational conflicts (co-activation or mixed feelings) fall indiscriminately around the midpoint of the unidimensional continuum by preventing respondents from reporting their positive and negative reactions separately (Ito, Cacioppo, & Lang, 1998; Larsen, Hemenover, Norris, & Cacioppo, 2003). On the contrary, the hypothesized multiple modes of motivational activation allow researchers to identify the origin of neutrality (Cacioppo, Gardner, &

Berntson, 1997). Table 3 represents a simplified illustration of such possibilities, in which the same evaluative score obtained by a bipolar measure (e.g., a midpoint on a bipolar scale) masks various possibilities with different underlying motivational activations. For the sake of simple demonstration, the weight of each motivation in Table 4 is set as 1. In reality, it is likely that the relative importance of one of the motivations will be stronger or weaker than the other. That is, the same manifestation on a bipolar scale can derive from more diverse combinations than those employed in the table.

Table 4.

Possible Routes of Null Findings (Indifference vs. Coexistence/Ambivalence)

Origin[4]		Observed Change (Persuasion)[5] = $M_{App} + M_{Avo}$	Interpretation of Failure: Distinction of Ambivalence (Coactivation) from Real Failure (Indifference)[6]
M_{App}	M_{Avo}	Evaluation Decision: Fail (no effect)	
0	0	0	Indifferent; coinhibition
1	-1	0	Somewhat ambivalent
2	-2	0	Highly ambivalent; strong coactivation

Note. These hypothesized combinations are presented based on the modifications of the following sources:
(1) *Table 1. Modes of Evaluative Activation and Their Attitudinal Properties* in "Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates" by J.T. Cacioppo and G.G. Berntson, 1994, *Psychological Bulletin, 115*(3), p. 417.
(2) *Table 2. Hypothetical Ap - An Combinations and Their Effects on Other Attitudinal Indexes for the Early Conception of a Bivariate Model* in "On the ambivalence-indifference problem in attitude theory and measurement: A suggested modification of the semantic differential technique" by K.J. Kaplan, 1972, *Psychological Bulletin, 77*(5), p. 369.

Applying this theoretical idea to the context of health research, when no effect was found in response to an antidrug health message, the lack of change could stem from

[4] M_{App} = approach motivation; M_{Avo} = avoidance motivation. For both motivations, assume use of a 3-point unipolar scale with anchors in 0 (not at all) and 3 (very much).
[5] The weight of each motivation is set as 1 for the purpose of a simple demonstration.
[6] The more the two motivations are coactivated, the greater the ambivalence that will occur.

two different occasions. One occasion is where the message recipients were unmotivated to change at all, and the other occasion is where they were in motivational conflict due to the co-occurrence of appetitive and aversive motivations. Thus, the interpretation of and the remedy for a lack of intended change should vary according to the underlying mechanism to maximize the message effects. Unfortunately, there has been little research that attempts to test and demonstrate the potential advantage of embracing the idea of the bivariate model in the field of health communication. To test the theoretical argument, therefore, the following research question is suggested:

> **RQ4**: How do motivational responses assessed by a traditional bipolar measure and two unipolar, independent measures differ from each other? Specifically, can using the bivariate operationalization of approach and avoidance motivations be more informative in identifying the origin of the change or the lack thereof?

Another important advantage of the bivariate framework lies in its ability to identify the unique relationships of approach and avoidance motivations to subsequent persuasive outcomes. The ESM posits that a persuasive outcome is the product of the unique or the joint function of the two substrates of motivation. Under this bivariate framework, it is conceivable that a message recipient may fail to change because of the relatively stronger influence of activated avoidance motivations even when approach motivation is simultaneously activated. Under the conventional bipolar framework, on the contrary, it is difficult to predict certain consequences that may be the result of a combined function of the two underlying drives.

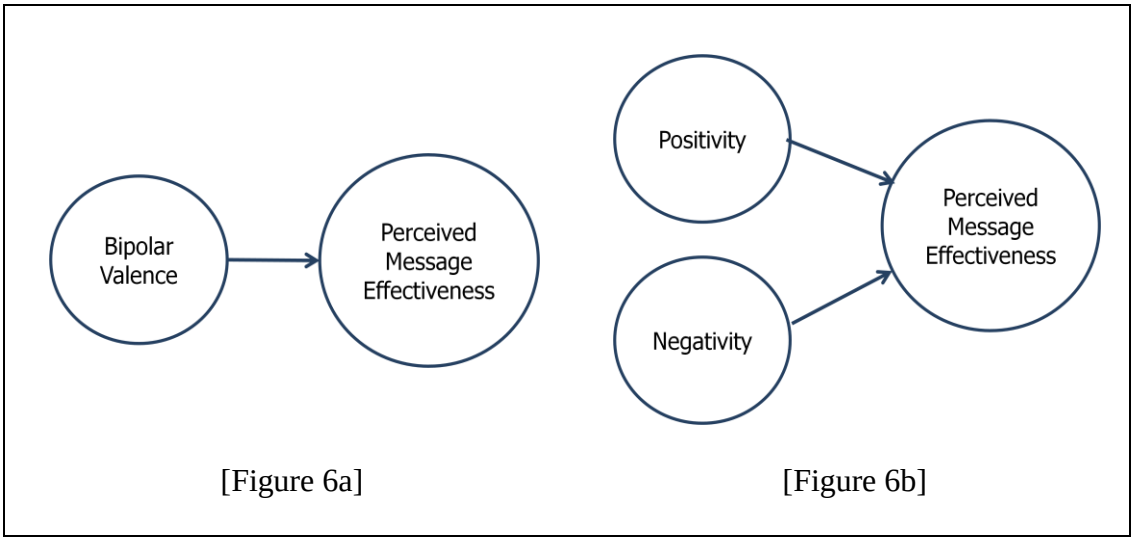
The bivariate model's ability to accurately identify the independent roles of the motivational substrates may be indicative of its superiority in the prediction of the

consequence of motivational processing over the traditional bipolar models. To test this idea, two competing models based on the different operationalization of motivational systems should be compared. Despite the potential influence of numerous external factors (e.g., individual differences influencing the processing of antidrug health messages), I only focus on two parsimonious models for the purpose of the present study— one with a bipolar motivational valence (Figure 6a) and the other with separate motivational substrates (Figure 6b)—to predict a well-known indicator of health message effects, *perceived message effectiveness*.

Perceived message effectiveness is defined as an evaluation of a message's persuasive potential (Dillard, Weber & Vail, 2007). Although the operationalization of perceived message effectiveness has been inconsistent, a factor-analytical test suggested that it actually consists of two dimensions, one indicating perceived persuasiveness interpretation whereas the other indicating pleasantness interpretation which is semantically different from perceived persuasiveness (Yzer, Vohs, Luciana, Cuthbert, & MacDonald III, 2011). Notably, the study suggested critical connections of those two elements of perceived message effectiveness with the two dimensions of emotion, such that the pleasantness perception for a message (i.e., *perceived message pleasantness*) was strongly connected to the valence dimension, whereas the convincingness perception for a message (i.e., *perceived message convincingness*) was strongly associated with the arousal dimension. Given that the perceived message convincingness signifies the evaluation of the persuasiveness of a message, the present study focuses on that dimension as an outcome variable to test the predictive powers of the two competing

models of motivational reactions (**RQ5a**). The relative influence of approach and avoidance motivations in predicting persuasive message convincingness will be also examined (**RQ5b**) as the last step to examine the potential benefits of utilizing a bivariate framework.

Figure 6. *Test of Two Competing Models: Prediction of Perceived Message Effectiveness with Bipolar vs. Bivariate Operationalization of Motivational Valence*



[Figure 6a] [Figure 6b]

Methods

Participants

A total of 311 undergraduate students from the University of Minnesota participated in the present study. Two university-wide research participation programs were used as the main recruitment tool. Once the study information was set up on the recruitment system, an invitation email was sent out to students who were enrolled in the research participation programs. Participation was voluntary, and participants received course credits or a $10 Starbucks e-gift card or $10 cash as study compensation.

Approval from the Institutional Review Board was obtained before recruitment and data collection began.

Study Design

This study builds on a study by Ito et al. (1998) that examined the activation patterns and functions of motivational substrates. In Ito et al.'s study, 472 still images were rated by 509 undergraduate students on various scales, including the conventional bipolar rating of valence, arousal, and dominance (SAM) and unipolar scales of positivity and negativity (BEAMS). While closely following Ito and colleagues' study, I included the evaluative space grid (ESG; Larsen et al., 2008) as an additional unipolar measure.

The main study used five PSA sets (each with 8 individual ads) with 3 different measurement conditions, including two types of bivariate measures (BEAMS and ESG) and one bipolar measure (a modified version of SAM). The study thus used a 5 (antidrug ad set) × 3 (types of measures of approach-avoidance motivation) between subjects design. Each participant viewed and rated 8 ads on one of the three instruments assigned. The presentation order of ads included in each ad set was randomized. In addition, for students who were assigned to either BEAMS or ESG conditions, the presentation order of the positivity and negativity scales were counterbalanced to control for an order effect. Details of the study design and assignment are described in Table 5.

Table 5.

Study Design and Assignment

Measurement condition
Measure type 1 = BEAM Measure type 2 = ESG Measure type 3 = Bipolar
Ad sets

Set 1 = 108, 109, 310, 201, 205, 207, 301, 302
Set 2 = 110, 112, 115, 203, 208, 304, 306, 309
Set 3 = 105, 106, 107, 204, 206, 303, 305, 313
Set 4 = 101, 103, 211, 212, 213, 114, 311, 314
Set 5 = 102, 104, 209, 210, 214, 215, 307, 312
Combined Study Conditions
Combination 1 = BEAM, Set 1
Combination 2 = BEAM, Set 2
Combination 3 = BEAM, Set 3
Combination 4 = BEAM, Set 4
Combination 5 = BEAM, Set 5
Combination 6 = ESG, Set 1
Combination 7 = ESG, Set 2
Combination 8 = ESG, Set 3
Combination 9 = ESG, Set 4
Combination 10 = ESG, Set 5
Combination 11 = Bipolar, Set 1
Combination 12 = Bipolar, Set 2
Combination 13 = Bipolar, Set 3
Combination 14 = Bipolar, Set 4
Combination 15 = Bipolar, Set 5
Controlling the Effect of Measure Presentation Order (only for BEAMS and ESG conditions)
Presentation order = 1 = positivity first, negativity second
Presentation order = 2 = negativity first, positivity second

Note. Ad sets were created only to avoid participants' fatigue, and the between-ad set differences are not the interest of the present study. The focus of this study is differences in ratings among the different types of motivational measures (collapsing the set-level differences). Thus, the three measurement groups categorized by measurement conditions were used in the main analyses.

Procedure

Two computer labs at the university were used as the main locations for the main study. When participants arrive at the labs, they received a brief description of the study and assigned to one of the cubicles in the computer lab, where they viewed the eight ads from one of the five sets of antidrug ads. When the participants were seated and ready, they first read a greeting and an online consent form. Only those who agreed to participate began the study with reading a detailed instruction page and by answering

questions about their demographic backgrounds. Participants who were assigned to rate on ESG had a practice session before they watched and rated the first ad shown in their session. Immediately after watching each 30-second ad, participants rated the ad on bipolar valence, arousal, positivity, and negativity. Each ad in a set was randomly ordered and shown only once within a session. After finishing their evaluations of all eight ads, participants answered questions about individual characteristics (e.g. demographics and previous substance use history). Upon completion participants were debriefed and received a $10 gift card or class credits.

Materials: Televised Antidrug Public Service Announcements

Compared to the printed images utilized by Ito, Cacioppo, and Lang (1998), a televised message is a combination of various audio-visual dimensions, which might lead to more complex motivational responses among the message recipients. In particular, this study focused on one popular method of conveying televised health messages, that is, public service announcements (PSAs). For the selection of the final set of ads to be included in Study 1, first, a broad range of antidrug PSAs were collected via YouTube (keywords included antidrug ads, antidrug commercials, and antidrug PSAs), the Above the Influence website (http://www.abovetheinfluence.com), and the Montana Meth Project website (http://montana.methproject.org/Our-Work/view-ads.php). Next, a review was conducted to determine ads that were appropriate for the purpose and the targeted participants of the present study. The exclusion criteria were as follows: (1) ads that contained unrealistic animated characters, (2) ads that targeted a much younger or older sample (e.g., middle-school students or parents) than the target sample of the study

(college students), and (3) ads with substantially lower production values and/or older production periods than others. In addition, the ads included in the final set of stimuli were approximately 30 seconds long, except a one-minute ad that were included due to its plot structure displaying both positive and negative components, and were in an electronic video format that could be inserted into a computerized questionnaire. Message design strategies for antidrug advertisements tend to focus on the negative consequence of using illicit drugs (i.e., loss framing) with message features that may exclusively produce negatively valenced feelings (Hornik, Jacobsohn, Orwin, Piesse, & Kalton, 2008; Kim, Yzer, Luciana, MacDonald III, & Vohs, 2012). Therefore, collected ads were further tested to confirm whether they exhibited the potential to produce a wide range of emotional valence on a negative/positive bipolar dimension. After this process, the final study materials consisted of 40 antidrug PSAs produced for national or statewide dissemination. To avoid the influence of participant fatigue on the rating task, each of the 40 selected ads was allocated to one of five ad sets, so that each participant viewed and rated only 8 ads included in one ad set. Table 6 presents a brief description of the selected ads.

Table 6.

Description of Study 1 Materials

Ad #	Target drug	Ad description/Main Copy	Source
1	Marijuana	A story of addiction – recovery (sisters playing a basketball)	2
2	Marijuana	A story of addiction – recovery (father and daughter jogging in the morning)	2
3	Marijuana	A boy taking off layers of T shirts (“Be yourself”)	1
4	Marijuana	A young couple having a date on a beautiful day	1
5	Marijuana	Follow your heart	1
6	Marijuana	A boy who refuses to fit into a scene of marijuana use	1

		("Is everything worth fitting into?")	
7	Marijuana	A boy surrounded by groups of people who argue for and against using marijuana decides to say no.	1
8	Marijuana	A boy gets free lunch from a restaurant owner as he refused to his friends' offer to use marijuana	1
9	Marijuana	A girl walking on the street ("Do I seem that I am gonna let anything influence me?")	1
10	Marijuana	A group of teens hanging out with friends and naturally putting away cannabis ("It's OK to pass")	2
11	Marijuana	A boy decides to refuse being transformed by others and to make his own decision	1
12	Marijuana	A boy talks about a variety of positive things he can do compared to other friends who are always high.	1
13	Marijuana	A boy looking at other boys getting high and sitting on a couch all day. ("Me? I will take my chances out there")	1
14	Marijuana	A little brother admires and copy his big brother	2
15	Marijuana	Boys are at drive-thru gets high repeatedly and hit a child on a bike by accident. ("Marijuana can slow your reaction time")	4
16	Marijuana	People list things proudly what they achieved after being addicted marijuana (enantiosis)	1
17	Marijuana	Friends are videotaping an unconscious girl being toyed like a puppet ("If you are not in control, who is?")	1
18	Marijuana	A boy getting a burning spot from a weed on his skin. ("Marijuana hurts more than just you")	1
19	Marijuana	A girl is rapping about a boy who sitting on the street doing nothing but weeds.	1
20	Marijuana	A boy was told to do stupid thing like outrunning a fierce dog. ("I don't think I can. I'm an idiot.")	1
21	Marijuana	A boy is carrying a big mirror to enlighten his friends. ("Sometimes friends can't see how drug and drinking changes them.")	1
22	Marijuana	A guy put his fist in his mouth because his friends told him to try it and can't get it out. ("I'm under influence of others.")	1
23	Marijuana	A dog talking to a girl to stop smoking weeds	1
24	Marijuana	A guy is mourning over his younger brother's death which was caused by himself because of marijuana.	1
25	Marijuana	A girl advises her friend to stop marijuana. ("We need to talk.")	1
26	Marijuana	A boy feels regret for getting high at party and not taking someone home as he promised.	1
27	Meth	A toxic fume from down story's meth production making up-story girl sick.	3
28	Meth	A gang broke into a family because of getting high on meth. ("This isn't normal. But on meth, it is.")	3
29	Meth	A boy said nothing when his friend confess his first attempt at meth. His friend ended up being confined to a	3

		psychiatric hospital.	
30	Meth	A girl said nothing when her friend confess her first attempt at meth. Her friend stared to sell her body and gave a birth three months early.	3
31	Meth	Two sisters trying to sell their body to get money for meth. ("This isn't normal. But on meth, it is.")	3
32	Meth	Everyone looks neat while one boy having a seizure. In fact they all look messy.	3
33	Meth	A boy stealing money from his mother's purse and beating her while she trying to stop him.	3
34	Meth	A boy wants to get in his house but his parents not let him in.	3
35	Meth	A warrior suddenly appears to stop two boys taking meth. ("A warrior won't be there to stop you. Only you can stop you.")	3
36	Meth	Friends dropping an unconscious girl in front of an E.R. ("Whatever happens, they look after me.")	3
37	Meth	A boy said "I am only gonna try meth once. I'm not gonna be like that guy." In the end, a girl said same thing looking at him.	3
38	Marijuana	A girl was haunted by grandmother because she stole money from grandmother to get marijuana.	1
39	Marijuana	What if your doctor, lawyer, local policeman get high while doing their job?	2
40	Marijuana	Friends force a girl to have body piercing. ("Don't want to. Don't have to.")	1

Note. Source: 1 = ONDCP (Above the Influence) (in collaboration with Partnership for Drug Free America); 2 = Partnership for Drug Free America; 3 = Montana Meth Project; 4 = others (#203: Freevibe.com)

Measures

Unipolar Valence Measures. Based on the result of the pretest demonstrating discrepancies between BEAMs and ESG ratings, both measures were included in the main study to separately evaluate the positivity and negativity of a motivational system. The same positivity and negativity measurement items were used (positivity measure items: delighted, pleasant, happy, approving, satisfied, good, and appealing ($\alpha = .96$), negativity measure items: unlikeable, unpleasant, disapproving, distressed, disagreeable, and uncomfortable ($\alpha = .95$). Participants were asked to indicate the extent to which each

adjective was a good description of their positive/negative motivational reactions to the ad on a 7-point scale, anchored by 1 (very slightly/not at all) and 7 (extremely). The same techniques with the pilot test (e.g., counterbalancing the order of positivity and negativity measures) were employed to minimize carryover effects.

Bipolar Valence Measures. In addition to the two forms of unipolar measures of motivational states, a bipolar measure of appetitive-aversive motivational response was also included, as a mean of comparing the scores of motivational evaluations obtained through two different measurement formats (i.e., a single bipolar versus two separate unipolar measurements). The bipolar conceptualization of the valence of emotions (Lang, 1995; Lang, Bradley, & Cuthbert, 1992) is operationalized in the self-assessment manikin (SAM; Bradley & Lang, 1994), which similar to semantic differentials posits positive and negative emotion as scale anchors. Originally, the SAM utilized a humanized picture where the leftmost human face is frowning, with sagging eyes and lips indicating "very negative, very unhappy, and very annoyed" and where the rightmost human face is smiling, indicating "very positive, very happy, and very pleased." In the original scale, participants are asked to mark any one of the five figures or the spaces between them, resulting in nine-point bipolar scales[7]. To make completion of SAM more comparable to BEAMs, the present study dropped the humanoid figures and only adopted the three pairs of polar opposite adjectives indicating emotional valence (negative-positive, unhappy-happy, and annoyed-pleased; $\alpha = .90$).

[7] While the original SAM is comprised of three dimensions, including *arousal* and *dominance*, as well as the valence dimension, the dominance dimension was dropped because the reliability of the dimension has not been as effectively established as the two other dimensions and it is not a focus of the present research.

Arousal. Arousal was measured with three items, i.e., aroused, excited, and awake, using 7-point scales ranging from 1 (not at all) to 7 (extremely; Lang, Shin, & Lee, 2005). Scores on the three items were averaged to compute an arousal rating for each ad (alpha=.84).

Perceived Message Effectiveness. Measurement items for the convincingness perception of a message were adopted from Yzer, Vohs, Luciana, Cuthbert, & MacDonald III (2011). The seven-point measures of perceived message convincingness include "extremely unconvincing – convincing," "bad – good," "forgettable – memorable," "worthless – valuable," and "effective – ineffective (reverse coded)." Scores on the five items were averaged to compute a message convincingness rating for each ad (alpha= .90).

General Analyses Plans

The ad was the unit of analysis in most analyses. To compute ad-level summary scores of bipolar valence, unipolar positivity, unipolar negativity and arousal, ratings from (the 18 to 23) participants who rated each individual PSA were averaged (see Table 7). For questions that required an analysis at the individual level, participant-based statistics were also computed. More specific analysis strategies for each research question are described in the following result section.

Table 7.

Number of Ratings Obtained for Each of the Study Conditions

		BEAMS	ESG	Bipolar	
Ad numbers	1	22	21	20	63
	2	20	21	20	61

3	22	21	20	63
4	20	21	20	61
5	21	22	22	65
6	21	22	22	65
7	21	22	22	65
8	19	18	20	57
9	19	18	20	57
10	20	23	22	65
11	20	23	22	65
12	22	21	20	63
13	20	23	22	65
14	19	18	20	57
15	20	23	22	65
16	21	22	22	65
17	19	18	20	57
18	21	22	22	65
19	19	18	20	57
20	20	23	22	65
21	20	21	20	61
22	20	21	20	61
23	22	21	20	63
24	22	21	20	63
25	22	21	20	63
26	20	21	20	61
27	20	21	20	61
28	19	18	20	57
29	19	18	20	57
30	21	22	22	65
31	20	23	22	65
32	21	22	22	65
33	20	23	22	65
34	20	21	20	61
35	20	23	22	65
36	22	21	20	63
37	20	21	20	61
38	21	22	22	65
39	22	21	20	63
40	19	18	20	57

Total number of ratings from participants	816	840	832	2488

Note. Each participant watched eight individual ads. This explains the total counts for ratings obtained from the three types of measures for each ad: N = 2,488 = 311 [number of participants] * 8 [number of ads viewed by one participant]

Results

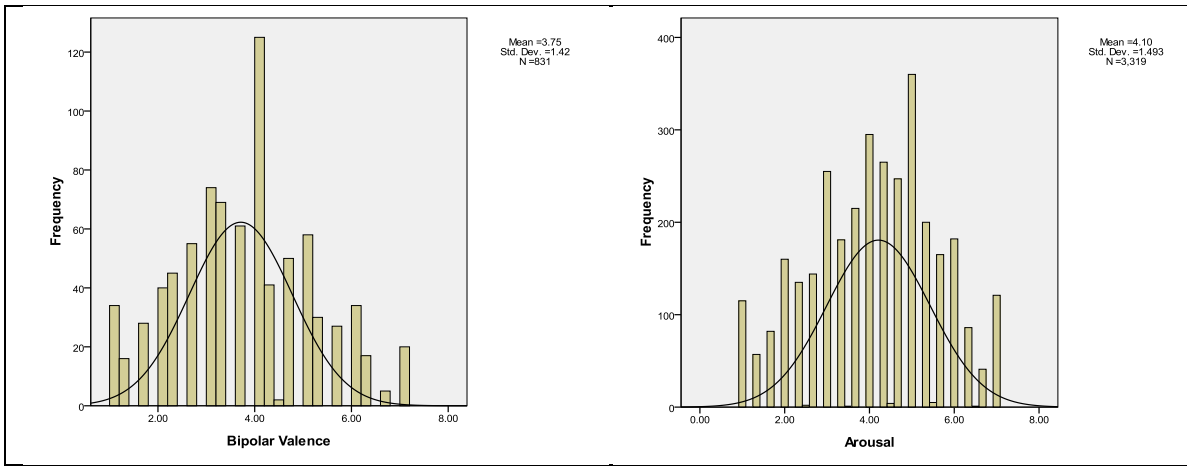
Descriptive Information

Three hundred and eleven students (N=311) at the University of Minnesota participated in the main study. Their mean age was 20.29 (SD = 2.10), with a range from 17 to 27 years old. The participants consisted of 99 males and 210 females (two participants did not report their gender), and were predominantly Caucasian (66.2%) followed by Asian (28.9%), African American (2.6%), others (1.3%), and Hispanic (0.6%).

Before turning to the primary analyses, I examined the bipolar valence and arousal ratings reported by individual participants. The distribution of bipolar valence ratings were slightly skewed (Figure 7, left), while participants' arousal ratings were fairly normally distributed (Figure 7, right). The slightly skewed valence ratings in the present study is not surprising given that the use of loss framing and unpleasantly sensational messages, which are highly likely to induce negative valence, are predominant strategies of antidrug message design in the field (Kim, Yzer, Luciana, MacDonald III, & Vohs, 2012). Despite the slightly skewed distribution of valence ratings, participants' ratings were fairly well distributed across the full range of the bipolar valence and arousal dimensions (valence: M = 3.75, SD = 1.42; arousal: M = 4.14, SD = 1.51; range: 1 to 7 for both dimensions). This indicates that the pre-

examination process of selecting stimuli that represent the entire affective system (i.e., stimuli that vary in their potential to produce a wide range of reactions) was successful.

Figure 7. *Distribution of Participant-Level Bipolar Valence and Arousal Ratings*



Evidence for the Multiple Modes of Motivational Activations (RQ1 – RQ3)

Analysis Framework 1-1: Inspection of ratings from bipolar and bivariate measures. The primary questions underlying this study asked whether diverse patterns of motivational activation can exist, beyond a reciprocal activation, in response to persuasive health messages. As the first analytical method, the computed ad-level mean ratings for positivity and negativity dimensions were examined to determine the activation patterns of the positivity and negativity of motivation (Table 8). The results show that there are not only ads that produce a reciprocal pattern of motivational activation, such as #4 (4.34, 1.31, exclusive activation of positivity), #5 (4.76, 1.33, exclusive activation of positivity), #32 (1.37, 5.01, exclusive activation of negativity), and #33 (1.69, 5.06, exclusive activation of negativity), but also ads that induce non-reciprocal patterns of motivational activation, such as ad #20 (2.74, 2.13), #22 (2.17, 2.43), #24 (2.48, 2.63), and #25 (2.29, 2.72). Similar findings are demonstrated when

another type of unipolar measure (ESG) is used, presenting both reciprocal, such as #4 (6.24, 1.29) and #5 (5.46, 1.32), and non-reciprocal, such as #20 (3.87, 3.30) or #25 (3.62, 3.52), patterns produced by several ads.

Table 8.

Mean Ratings Assessed by Different Types of Measures (Bipolar Measure vs. Bivariate)

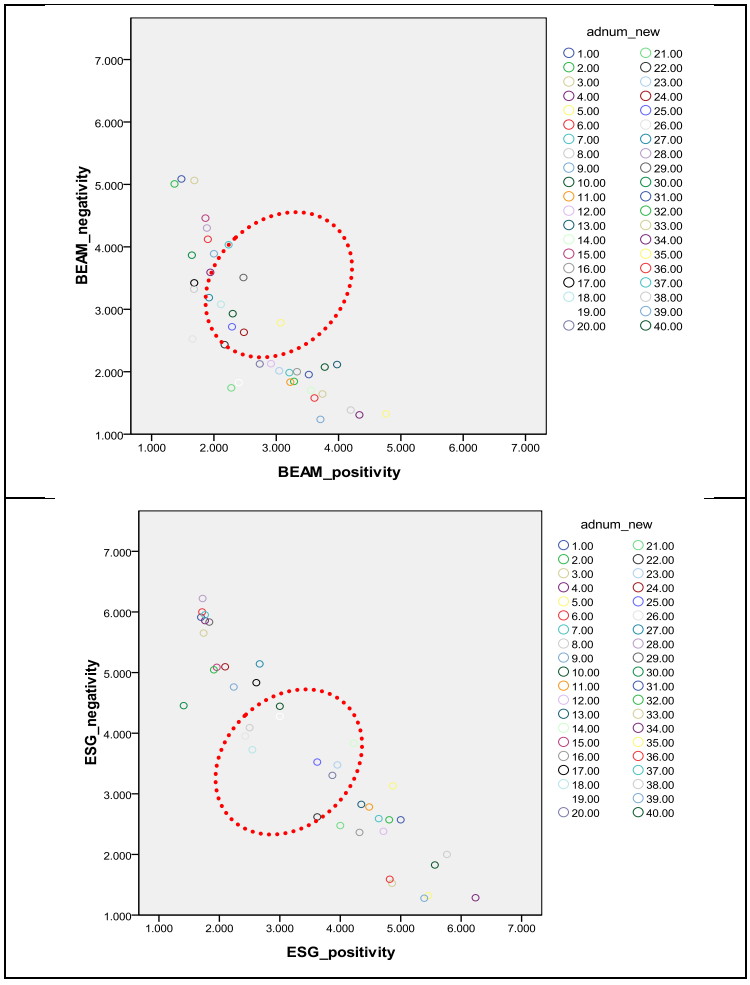
Ad#	**BP** M=3.75, SD= .88	**BEAMS_P** M=3.48, SD=1.42	**BEAMS_N** M=2.74, SD=1.12	**ESG_P** M=3.48, SD=1.42	**ESG_N** M=3.69, SD=1.53	**Arousal** M=4.14, SD= .55
1	4.35	3.52	1.96	5.00	2.57	4.06
2	4.45	3.29	1.85	4.81	2.57	4.10
3	4.30	3.74	1.64	4.86	1.52	3.25
4	5.43	4.34	1.31	6.24	1.29	3.60
5	5.11	4.76	1.33	5.46	1.32	4.07
6	4.95	3.61	1.58	4.82	1.59	4.13
7	4.71	3.21	1.99	4.64	2.59	4.08
8	5.18	4.20	1.39	5.77	2.00	4.04
9	4.42	3.71	1.24	5.39	1.28	3.42
10	5.05	3.78	2.08	5.57	1.83	3.98
11	3.80	3.23	1.83	4.48	2.78	3.61
12	4.75	2.92	2.13	4.71	2.38	3.61
13	4.21	3.98	2.12	4.35	2.83	4.05
14	3.98	3.56	1.70	4.22	3.83	4.38
15	2.77	1.86	4.46	1.96	5.09	4.13
16	4.47	3.33	2.00	4.32	2.36	4.04
17	3.65	1.68	3.42	2.61	4.83	3.82
18	3.20	2.11	3.08	2.55	3.73	3.65
19	3.83	2.40	1.83	3.00	4.28	3.61
20	4.09	2.74	2.13	3.87	3.30	3.91
21	4.30	2.28	1.74	4.00	2.48	3.40
22	3.65	2.17	2.43	3.62	2.62	3.59
23	4.38	3.05	2.02	3.95	3.48	3.97
24	3.32	2.48	2.63	2.10	5.10	4.50
25	3.67	2.29	2.72	3.62	3.52	3.61
26	3.41	1.66	2.53	2.43	3.95	3.60
27	2.92	1.92	3.19	2.67	5.14	4.29
28	2.55	1.89	4.30	1.72	6.22	5.32
29	3.33	2.47	3.51	1.83	5.83	4.98
30	3.17	1.65	3.87	1.41	4.46	4.36

31	1.99	1.48	5.09	1.70	5.91	4.60
32	2.68	1.37	5.01	1.91	5.05	4.31
33	2.18	1.69	5.06	1.74	5.65	5.02
34	2.73	1.94	3.59	1.76	5.86	5.18
35	3.96	3.07	2.78	4.87	3.13	4.60
36	2.98	1.90	4.12	1.71	6.00	5.00
37	2.70	2.24	4.03	1.76	5.95	5.29
38	3.23	1.68	3.32	2.50	4.09	4.41
39	2.95	2.00	3.89	2.24	4.76	4.55
40	3.23	2.30	2.93	3.00	4.44	3.42

*Notes.*1. BP = bipolar valence ratings; BEAMS_P = positivity scores obtained by BEAMS; BEAMS_N = negativity scores obtained by BEAMS; ESG_P = positivity scores obtained by ESG; ESG_N = negativity scores obtained by ESG; 2. Both BEAMS and ESG were rated on a 7-point scale; 3. The averaged mean ratings (with standard deviations) are reported on the first column of each dimension.

Next, the inspection of ratings mapped out on the two-dimensional evaluative space grid (ESG) is utilized to determine the activation patterns of approach and avoidance motivation. For example, a rating at the bottom edge of the grid means that an ad exclusively induced positivity. If an ad exclusively induced negativity, then ratings are placed along the left edge of the grid. These two scenarios indicate the mutually exclusive activation of approach and avoidance motivation, which is hypothesized by the two-dimensional models of emotion. On the contrary, non-reciprocal activation patterns are indicated by ratings placed in the middle area of the grid, ranging from the left bottom to the right top side of the evaluative space that the grid represents.

Figure 8. *Distribution of Plots consisting of Positivity and Negativity Ratings on a Two-dimensional Evaluative Space*

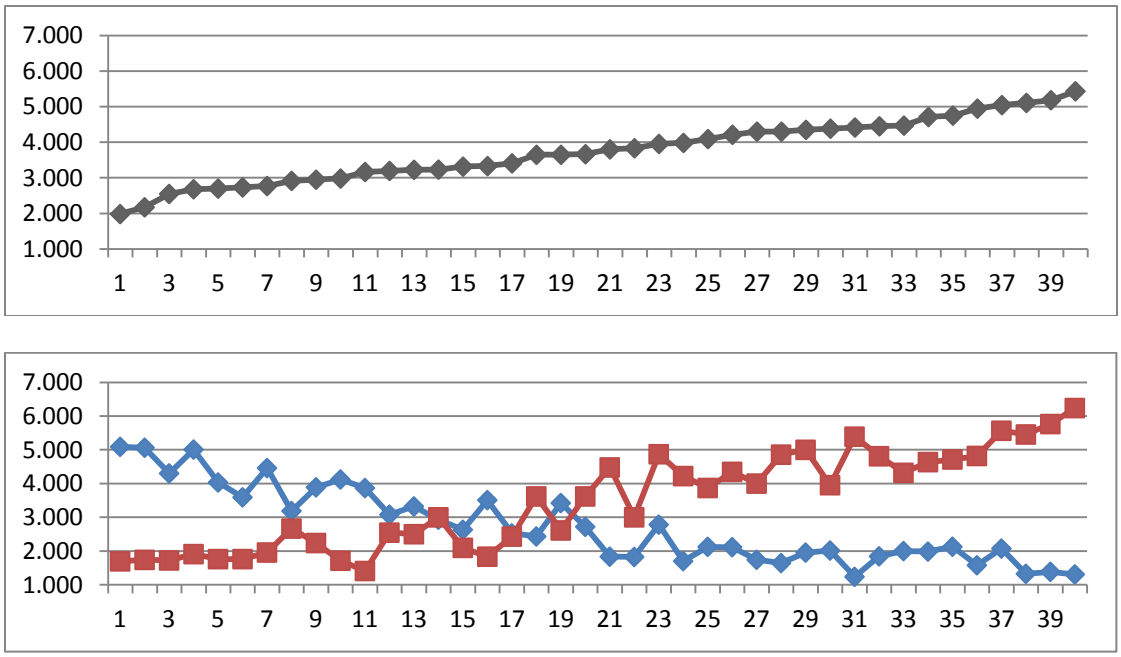


Note. The units of analysis for Figure 7a and 7b were ads (N=40).

As shown in Figure 8, the majority of ads examined in this study appeared to produce reciprocally activated positivity or negativity, as most of the plots in both upper- and lower-side graphs the two different types of measures are mapped areas indicating reciprocal modes of motivational activation. However, several ads are found in the lower-middle part of the evaluative space, indicating the pattern of weak co-activation.

In addition, a visual inspection of the mean ratings obtained by the two types of measures can depict well how ads produce non-reciprocal patterns of motivational activation. On the upper graph in Figure 9, the mean ratings obtained by the bipolar measure were sorted and plotted in ascending order for ease of direct comparison to the unipolar positivity and negative ratings illustrated in the lower graph.

Figure 9. *Comparison of Bipolar Valence Ratings with Independent Bivariate Measures*



Note. The gray line in the upper graph indicates bipolar valence ratings; the red and blue lines in the lower graph indicate the separately assessed negativity and positivity, respectively.

In line with the findings presented above, inspection of the graphs showed that in most cases, the positivity and negativity of motivation are reciprocally activated, but non-reciprocal activation patterns (both coactivation and coinhibition) also exist, exampled by #22, #23, and #24 on the comparison graphs. Notably, such non-reciprocal cases were found around the midpoints of the bipolar valence line, whereas reciprocity appeared strong at extreme positive or negative bipolar values. These findings based on the

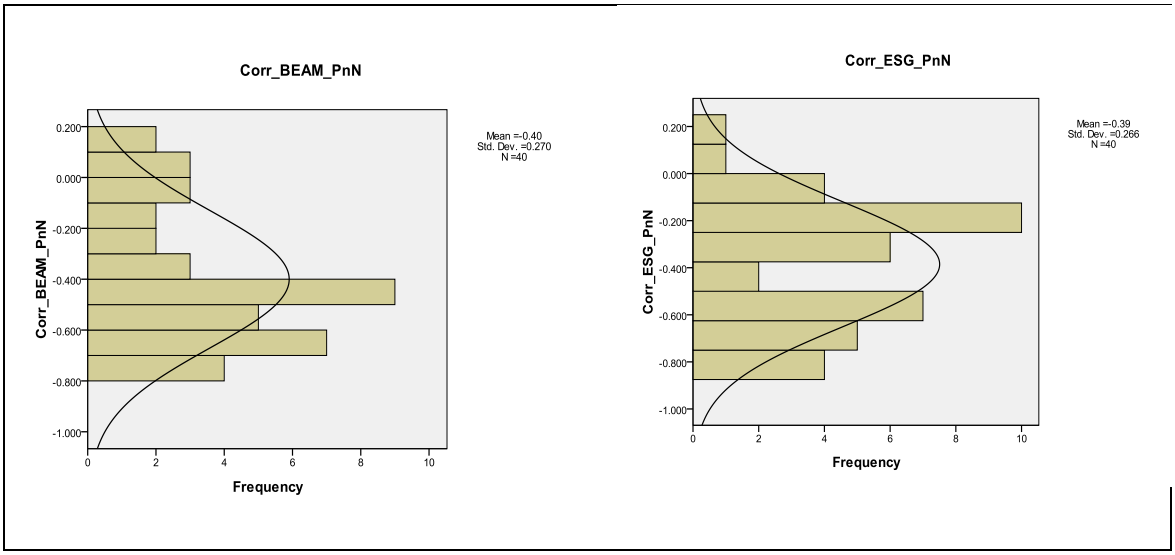
numeric and visual inspection of positivity-negativity ratings demonstrated that an ad can evoke approach and avoidance reactions non-reciprocally.

Analytical Framework 1-2: Examination of Correlations between Approach and Avoidance Motivations. The third piece of evidence for multiple modes of approach and avoidance motivation was also examined, closely following the procedure used in Ito, Cacioppo, and Lang's study (1998). To review the operational definition for ad-based activation patterns (Cacioppo & Berntson, 1994), a *reciprocal activation ad* refers to an ad that increases approach motivation while decreasing avoidance motivation, or vice versa. This motivational pattern is indicated by a correlation approaching -1 between the elicited approach and avoidance motivations. Two types of ads demonstrating a non-reciprocal motivational activation were also identified. An *uncoupled activation ad* (or functionally independent ad) is an ad that affects only approach motivation or avoidance motivation. This pattern is represented by a correlation between approach and avoidance motivations that is close to 0. Lastly, an ad that increases both approach and avoidance motivation (a *co-activating ad*), or that decreases both approach and avoidance motivation (a *co-inhibiting ad*), is indicated by a positive correlation between the elicited approach and avoidance motivations[8]. The unit of this analysis is again the ad, as reciprocal or non-reciprocal activation patterns will be indicated by correlations between ad-level positivity and negativity scores.

[8] Originally, Cacioppo and Berntson (1994) classified non-reciprocal activation (co-inhibition or co-activation) as a separate activation mode from uncoupled activation, but in this study an ad producing any type of non-reciprocal activation, in opposition to a reciprocal activation, will be referred to as non-reciprocal.

I first examined the distribution of positivity-negativity correlation coefficients for the 40 ads. If the increase in one motivation is equivalent to the decrease in the other motivation, all of these ad-level correlations would show strong negative associations. As shown in Figure 10, while more than 70% of the ads displayed correlation coefficients exceeding –.40 (indication of reciprocal activation), some of the ads demonstrated non-reciprocal modes of motivational activation, indicated by correlations close to 0 (an uncoupled activation). Some also indicated positive correlations (co-inhibition or co-activation). The investigation of the pattern of motivational activation with ESG reached a similar conclusion although the modes in the two data sets (i.e., the coefficient that appears most often) were located in two different areas: one approximately between –.40 and –.50, and the other approximately between –.15 and –.25, for BEAMS and ESG respectively.

Figure 10. *Distribution of positivity-negativity correlation coefficients for 40 ads*



To examine the activation patterns more closely, I correlated each ad with the positivity and negativity ratings from individual participants. The computed correlations, along with mean values, are reported in Table 9.

Table 9.

Ad-level Correlations Between Positivity and Negativity

Ad#	BEAMS_$r_{P,N}$	BEAMS_P	BEAMS_N	ESG_$r_{P,N}$	ESG_P	ESG_N
1	-0.59	3.52	1.95	0.24	5.00	2.57
2	-0.16	3.29	1.85	-0.16	4.81	2.57
3	-0.69	3.74	1.64	-0.16	4.86	1.52
4	-0.38	4.33	1.31	-0.38	6.24	1.29
5	-0.63	4.76	1.33	-0.14	5.45	1.32
6	-0.42	3.61	1.58	-0.10	4.82	1.59
7	-0.41	3.21	1.99	-0.19	4.64	2.59
8	-0.50	4.20	1.39	-0.24	5.76	2.00
9	-0.44	3.71	1.24	-0.33	5.39	1.28
10	-0.58	3.78	2.08	-0.30	5.57	1.83
11	-0.45	3.23	1.83	-0.23	4.48	2.78
12	-0.33	2.92	2.13	-0.63	4.71	2.38
13	-0.72	3.98	2.12	-0.58	4.35	2.83
14	-0.50	3.56	1.70	-0.53	4.22	3.83
15	-0.66	1.86	4.46	-0.32	1.96	5.09
16	-0.44	3.33	2.00	-0.10	4.32	2.36
17	-0.36	1.68	3.42	-0.59	2.61	4.83
18	0.03	2.11	3.08	-0.33	2.55	3.73
19	0.05	2.40	1.82	-0.08	3.00	4.28
20	-0.40	2.74	2.13	-0.37	3.87	3.30
21	-0.28	2.28	1.74	0.05	4.00	2.48
22	-0.04	2.17	2.43	-0.18	3.62	2.62
23	-0.64	3.05	2.02	-0.51	3.95	3.48
24	-0.56	2.48	2.63	-0.70	2.10	5.10
25	-0.64	2.29	2.72	-0.19	3.62	3.52
26	-0.12	1.66	2.53	-0.49	2.43	3.95
27	-0.08	1.92	3.19	-0.86	2.67	5.14
28	-0.60	1.89	4.30	-0.22	1.72	6.22
29	-0.67	2.47	3.51	-0.19	1.83	5.83
30	-0.09	1.65	3.87	-0.12	1.41	4.45
31	-0.75	1.48	5.09	-0.65	1.70	5.91

32	0.13	1.37	5.01	-0.56	1.91	5.05
33	-0.77	1.69	5.06	-0.69	1.74	5.65
34	-0.43	1.94	3.59	-0.80	1.76	5.86
35	-0.51	3.07	2.78	-0.61	4.87	3.13
36	-0.61	1.90	4.12	-0.80	1.71	6.00
37	0.19	2.24	4.03	-0.69	1.76	5.95
38	-0.26	1.68	3.32	-0.61	2.50	4.09
39	-0.75	2.00	3.89	-0.81	2.24	4.76
40	0.07	2.30	2.93	-0.27	3.00	4.44

Notes. BEAMS_$r_{P,N}$ = correlation between positivity and negativity obtained by BEAMS; ESG_$r_{P,N}$ = correlation between positivity and negativity obtained by ESG; BEAMS_P = positivity scores obtained by BEAMS; BEAMS_N = negativity scores obtained by BEAMS; ESG_P = positivity scores obtained by ESG; ESG_N = negativity scores obtained by ESG

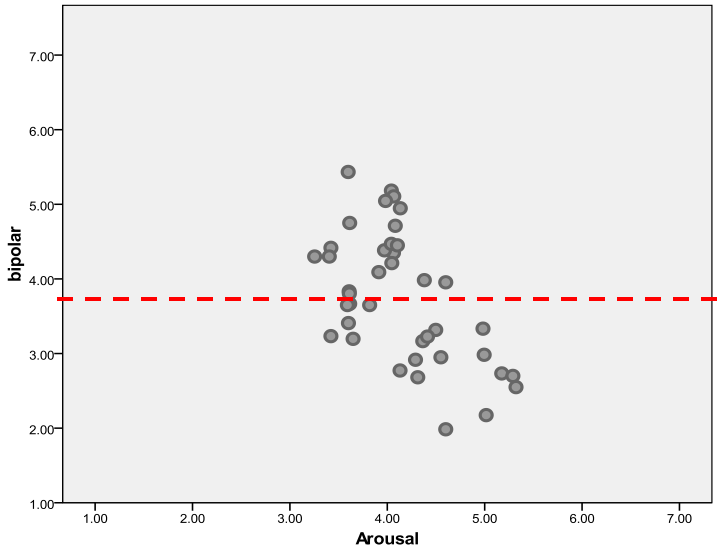
These findings demonstrated that ads can induce both non-reciprocal activation as well as reciprocal activation. The correlation between appetitive and aversive reactions ranged from –.77 to .19 (–.86 to .24 for ESG_$r_{P,N}$), with a mean correlation of –.40 (–.39 for ESG_$r_{P,N}$). The mode of reciprocal activation was indicated by strong negative within-ad correlations, as observed in ads such as #36 (BEAMS_$r_{P,N}$ = –.61, ESG_$r_{P,N}$ = –.80) and #39 (BEAMS_$r_{P,N}$ = –.75, ESG_$r_{P,N}$ = –.81). However, consistent with the principle of bivalent evaluative activation, evidence of other patterns of activation was also found. For instance, # 2 (BEAMS_$r_{P,N}$ = –.16, ESG_$r_{P,N}$ = –.16) and # 19 (BEAMS_$r_{P,N}$ = .05, ESG_$r_{P,N}$ = –.08) demonstrate the lack of a strong negative or positive relationship between positivity and negativity ratings, which is indicative of uncoupled activation. Ads with a positive correlation between the positivity and negativity ratings were also found (e.g., #37: BEAMS_$r_{P,N}$ = .19, #1: ESG_$r_{P,N}$ = .29), while very few, demonstrating co-activation of the two motivational states. However, the positive associations were not statistically significant ($p > .05$), and substantial

discrepancies between ratings from BEAMS and ESG were found in correlation scores for ads demonstrating such co-activation.

In addition to the within-ad correlations, correlations between mean positivity and negativity ratings across ads were examined. Remember that one participant rated eight different PSAs on the positivity and negativity dimensions. In this analysis, therefore, ratings from each of the eight ads were averaged to compute a within-participant correlation between mean positivity and negativity scores. The result revealed that, in general, positivity and negativity ratings obtained from individual responses were inversely correlated, but the coefficient was far less than 1 ($r = –.55$, $p < .00$, as calculated by BEAMS ratings). This association signifies that there were participants who reported non-reciprocal patterns of motivational activation as well as participants who reported increased appetitive reaction to an ad in conjunction with decreased aversive reaction (i.e., a reciprocal activation pattern).

Analytical Framework 2: Test of the Two-dimensional Structure of Motivation: Associations between Arousal and Valence Systems. The third research question asked whether the arousal–valence associations obtained from the separate positivity and negativity measures differed from association patterns found for bipolar valence measures. I first plotted the bipolar valence and arousal scores for each ad in the two-dimensional space that consisted of arousal and bipolar valence (Figure 11).

Figure 11. *Distribution of Arousal–Bipolar Valence Ratings for 40 Ads*



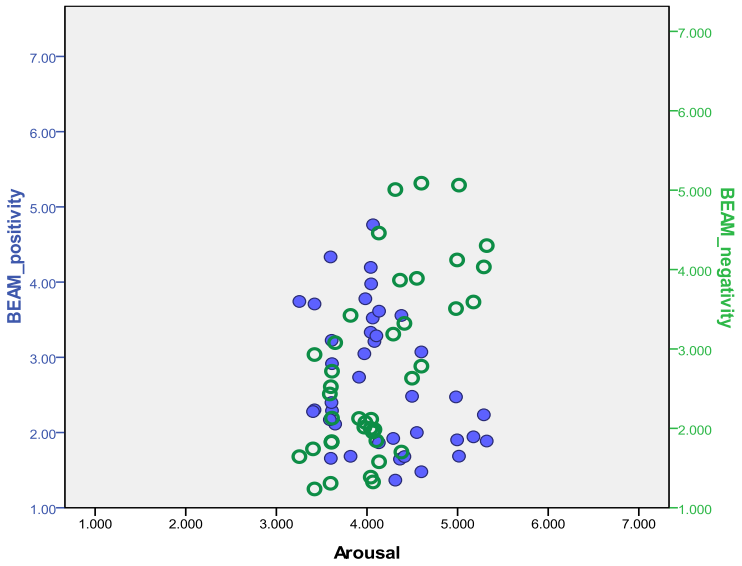
*Note*s. 1. The average of arousal-valence correlation scores for the 40 ads was -.56 ($p < .00$); 2. The red dotted line indicates the mean value of bipolar valence ratings (M = 3.75, SD = .86).

Consistent with previous findings (see Figure 5), while the arousal and valence was negatively associated, the observation of the mean-split arousal–valence relationship reveals a boomerang-shaped pattern rather than a completely linear negative association. For ads that were rated above the mean valence score, the valence tends to be positively associated with increased arousal, but for ads below the midpoint, the valence tends to be negatively associated with arousal. In other words, the investigation of the arousal–valence relationship utilizing the bipolar valence ratings demonstrated that increased arousal ratings were associated with increased activation of both positive and negative motivational valence.

If the bipolar categorization of ads (i.e., either a positively or a negatively valenced ad) created by splitting bipolar valence ratings can sufficiently represent the structure/activation of the underlying approach and avoidance valence systems, a separate

investigation of the arousal–positivity and arousal–negativity relationships should demonstrate a similar upward-sloping vector for both of the associations. To test this idea, I next examined the associations between arousal and the separate positivity and negativity ratings obtained from BEAMS.

Figure 12. *Distribution of Arousal–Separate Positivity and Negativity Ratings for 40 Ads*



Notes. Open circles indicate the negativity ratings for the 40 ads; closed circles present the positivity ratings for the ads; all dimensions (arousal, negativity, and positivity) were rated on a 7-point scale.

As shown in Figure 12, different association patterns emerged from the arousal–bipolar valence association described in Figure 11. When examined separately, the increase in positivity was negatively associated with arousal ($r = –.35$, $p < .05$), whereas the increase in negativity was positively associated with arousal ($r = .65$, $p < .001$). That is, while the association between arousal and negativity appeared to be analogous to the corresponding association between arousal and mean-split negative valence, the association between arousal and positivity were in the opposite direction to the association between arousal and the mean-split positive valence. This result indicates the

possibility of non-reciprocal activations and unique processing patterns for the approach and avoidance motivations, in accordance with the postulation of bivariate models.

The investigation of arousal–positivity/negativity associations for each ad (Table 10) further provided evidence of such a possibility. If the activation of one valence system is negatively related to the activation of the other valence system (i.e., a reciprocal mode of motivational activation), the size of the association between the arousal and positivity ratings should correspond to a similar size of arousal–negativity association in the opposite direction. The findings of the present study demonstrated that this was not the case. As presented in Table 10, different ads produced different association patterns. Some ads, such as #2, #17, and #35, demonstrated that the magnitude of both the positivity and negativity increase as arousal increases, while there are ads (e.g., #4, #9, and #39) that demonstrate that one motivational system is associated with increased arousal and that the other motivational systems is associated with decreased arousal. All in all, the findings suggested that the separate examination of arousal–valence associations provides information that might be undetectable when only a bipolar measure of valence was utilized.

Table 10.

Correlations between Arousal and Positivity and Negativity for Each Ad

Ad#	$r_{arsl,BP}$	$r_{arsl,pst}$	$r_{arsl,ngt}$
1	0.55	0.69	-0.14
2	0.31	0.50	0.35
3	0.71	0.72	-0.41
4	0.41	0.63	-0.52
5	0.75	0.80	-0.63
6	0.51	0.73	-0.59

7	0.71	0.52	-0.36
8	0.79	0.28	-0.06
9	0.74	0.46	-0.42
10	0.31	0.38	0.01
11	0.52	0.52	0.19
12	0.56	0.75	-0.28
13	0.41	0.66	-0.70
14	0.46	0.41	-0.25
15	0.47	0.31	0.04
16	0.74	0.28	-0.24
17	0.47	0.51	0.32
18	0.39	0.61	-0.27
19	0.28	0.13	-0.04
20	0.65	0.62	-0.28
21	0.65	0.52	-0.39
22	0.40	0.56	-0.21
23	0.24	0.79	-0.39
24	0.13	0.66	-0.05
25	0.51	0.64	-0.39
26	-0.07	0.33	-0.03
27	0.24	0.48	-0.06
28	-0.20	0.39	-0.07
29	0.00	0.31	0.01
30	0.05	-0.01	0.37
31	0.32	0.27	0.04
32	0.28	0.02	0.25
33	0.26	0.27	0.05
34	-0.11	0.17	-0.34
35	0.42	0.47	0.26
36	-0.34	0.34	-0.06
37	0.10	0.25	-0.14
38	0.51	0.11	0.20
39	0.11	0.31	-0.20
40	0.30	0.62	0.12

Analytical Framework 3: Convergence between BEAMs and ESG. The series of analyses described above show that findings obtained from BEAMs and ESG are similar in the general conclusion about the patterns of motivational activation, but dissimilar in details. For instance, both measures consistently demonstrated the evidence of independent and simultaneous activation of approach and avoidance motivations, based on the inspection of positivity-negativity ratings (see Table 8) and positivity-negativity associations (see Table 9). However, notable inconsistencies were also found, especially with ads which produced non-reciprocal motivational responses. For example, while ad #1 demonstrated a reciprocal pattern of motivational activations when BEAMs was used (r = –.50), the same ad was determined as a coactive ad when ESG was used (r = .24). Similar cases were found for ads that were determined to independently produce the two motivational reactions, such as #5, in which a strong negative relationship between positivity and negativity ratings was found with BEAMs (r = –.63) but only weak negative relationship close to 0 was demonstrated with ESG (r = –.14).

Evidence for the Utility of Bivariate Conceptualization and Operationalization of Motivational Systems (RQ4 – RQ5)

Analytical Framework 4: Test of the Origin of Neutrality. In addition to exploring the possibility of non-reciprocal activation patterns of approach and avoidance motivations in response to health messages, analyses to investigate the possible merits of using bivariate independent measures were also conducted. First, the comparison of positivity and negativity ratings obtained from a conventional bipolar measure and the alternative bipolar measures (see Table 8) revealed that there are cases where an observed

lack of change on a bipolar measure (in this case, bipolar valence ratings close to the midpoint of the 7-point bipolar scale) consists of different combinations of positivity and negativity, rather than just inactivity/indifference. For instance, both ads #3 and #21 were rated as 4.3 when the bipolar measure was used, but the seemingly identical values were derived from different underlying motivational substrates, (3.74, 1.74) and (2.28, 1.74), respectively, when measured with BEAMS. A similar and more dramatic example was found in the comparison of ratings for ads #11 and #19 when measured with ESM. Whereas these ads showed similar bipolar values (3.80 and 3.83, respectively), the combinations were substantially varied (4.48, 2.78) for #11 and (3, 4.28) for #19. This finding indicates that while a bipolar approach lacks the ability to gauge the initial levels of approach-avoidance motivations, independent measures of motivational valence can identify whether the lack of change is the result of the inactivation in approach motivation or the joint product of the simultaneously activated approach and avoidance motivations.

Analytical Framework 5: Test of the Predictive Powers of a Bipolar and Bivariate Model. Lastly, two competing models with the bipolar or bivariate measures which predict perceived message convincingness were compared. The result of two regression analyses with each of the measures showed that the model with separate positivity and negativity measures demonstrated stronger predictive power than the model with a bipolar valence. While about 25 percent of variance in the message convincingness perception was explained by the bipolar model, the bivariate model

accounted for more than 40 percent of variance in the convincingness evaluation (Table 11).

Table 11.

Results of Regression Analyses Predicting Perceived Message Convincingness

	B	*SE*	t- value with significance
Model 1 with bipolar operationalization of valence	R^2 = .26, Std. Error of the Estimate = .50, F chance with the predictor = 13.03**		
Bipolar valence	-.33	.09	-3.61**
Model 2 with bivariate operationalization of valence	R^2 = .41, Std. Error of the Estimate = .45, F chance with the predictor = 12.83**		
Positivity	.24	.14	1.50 (p = .14)
Negativity	.46	.11	3.32**

Notes. **p < .001. *p < .005; Positivity and negativity were measured by BEAMs.

As shown in Table 11, the comparison of the two models revealed different predictive patterns for the same persuasive outcome. In the bipolar model, motivational valence appeared to negatively influence perceived message convincingness (B = –.33, p< .00). This tells us that the more message recipients develop appetitive reactions to an antidrug ad, the less they perceive the message as persuasive. However, when separate positivity-negativity measures were used, both of the motivational substrates positively affected the message effectiveness perception. Specifically, while the two motivational reactions positively influenced perceived message effectiveness, the relative importance of aversive reaction was stronger (B = .24 vs .46). This finding cannot be demonstrated by the first model, where only a bipolar measure is used to predict a message evaluation outcome. The same analyses with the ESG showed a consistent pattern, although the specific coefficients were different.

CHAPTER IV. DISCUSSION AND CONCLUSION

Discussion of Findings: Theoretical and Practical Implications

The present dissertation research was designed to gain a better understanding of the structure of motivational systems that underlie health message processing. To achieve this, I compared two alternative models of affect-based motivation, including the two-dimensional model (i.e., the arousal-valence model) and the evaluative space model (ESM) (i.e., the bivariate model). While both models agree that valence and arousal of emotion are the critical dimensions of motivation, one proposes that the activation of negative and positive valence, as indicators of avoidance and approach motivations, is mutually exclusive, whereas the other proposes that the two valence systems may be simultaneously activated. Thus, I first focused on investigating the separability of the approach and avoidance motivations and their associations with the arousal system. Subsequently, I examined the implication of utilizing the bivariate conceptualization of motivational valence systems for the study of health message effects, particularly focusing on what it can better propose than the traditional bipolar conceptualization of motivational valence.

Findings from the series of analyses reported here provide a compelling argument for health communication researchers and practitioners to consider the bivariate conceptualization and operationalization of motivational systems. In accordance with the main postulation of the bivariate model, I found evidence for both reciprocal and non-reciprocal motivational activation, although in my sample of antidrug ads, reciprocal

activation occurred more frequently. In addition, the results demonstrated that the alternative bivariate model was more useful in interpreting and predicting the effect of antidrug health messages than the conventional bipolar model. Next, I will turn to an interpretative discussion of the specific findings.

The Structure of Motivation: Evidence for the Multiple Activation Modes of Motivational Valence Systems

The investigation of motivational valence ratings obtained from different positivity and negativity measures revealed that the two motivational valence systems can be uniquely activated. While the majority of antidrug ads used in this research produced either approach or avoidance reactions, there were a few ads that induced both reactions simultaneously.

This pattern was first indicated by ad-based motivational valence ratings obtained from two types of bivariate measures, which separately assessed approach and avoidance reactions (**RQ1a, Analysis 1-1**). For example, ads that produced exclusive activation of approach or avoidance reaction (e.g., an ad with the averaged mean rating of 4.76 on a seven-point positivity scale coupled with the averaged mean rating of 1.33 on a seven-point negativity scale) indicated the reciprocal activation of motivational valence systems, whereas ads that induced both approach and avoidance reactions (e.g., an ad with the averaged mean rating of 2.48 on a seven-point positivity scale coupled with the averaged mean rating of 2.63 on a seven-point negativity scale) signified the non-reciprocal activation of two valence systems.

The same pattern was also demonstrated by a different type of analysis, which examined associations between positivity and negativity ratings (**RQ1b, Analysis 1-2**). At an ad-level analysis, ads inducing uncoupled or simultaneous activation of the two motivational valence systems (i.e., ads with positivity-negativity correlations close to 0 or with positive correlation coefficients) existed, while ads displaying strong, negative correlation coefficients were more frequently observed. A participant-level analysis also showed that there were participants who reported non-reciprocal patterns of motivational activation in response to antidrug messages.

The investigation of the arousal-valence association for each ad (**RQ2, Analysis 2**) also revealed that there were occasions where both approach and avoidance motivations increased as arousal increased, whereas in other occasions one motivation was associated with increased arousal and the other motivation was associated with decreased arousal. This finding provided additional evidence that the approach-avoidance motivations underlying emotional valence can exist and function independently.

The last piece of evidence for the occurrence of non-reciprocal patterns of motivational activation was demonstrated by validating the above findings with two different types of bivariate measures (**RQ3, Analysis 3**). While the two measures employed in the present study both have the capacity of assessing approach and avoidance reactions independently, one consisted of multi-item positivity and negativity scales (BEAMs) and the other was a single-item measure of positivity and negativity with a format of 7 * 7 grids (ESG). Findings regarding the structure of motivational systems obtained from ESG consistently demonstrated the results obtained from BEAMs, adding

confidence to the potential of multiple approach-avoidance activation patterns, hypothesized by the bivariate model of evaluative space.

Given that the purpose of the present study was to test the main postulation of the bivariate model, aforementioned findings that demonstrated the non-reciprocal activation of motivational valence systems are critical. However, another important finding may deserve a preceding discussion to the discussion about such findings. For the majority of ads examined in the present study, the positive and negative reactions were negatively associated, indicating a reciprocal motivational activation pattern. In addition, the effect sizes of the non-reciprocal activation patterns (uncoupled or coactive) found in this study were small and did not reach statistical significance. This result is consistent with previous findings from Ito et al. (1998), which reported that many of the positive positivity-negativity correlations they found in response to evocative images were not statistically significant. These findings suggest that whereas non-reciprocal activation of approach and avoidance motivational systems exists, perhaps it is quite hard to empirically demonstrate, it is a less frequent phenomenon than reciprocal activation, and/or it does not stay long.

The first possibility might be the primary barrier for any studies, including the present one, examining approach and avoidance motivations. For example, in Ito et al. (1998), which is arguably one the most central tests of activation patterns, a small positivity-negativity correlation, substantially weaker than –1, was indicative of the independence of approach and avoidance motivational activation. Following the procedure, the present research also demonstrated the mean correlation of –.40 (with

BEAMs) between appetitive and aversive reactions, supporting the bivariate model's independence hypothesis. However, mixed results have been reported among studies that utilized this method, demonstrating strongly negative correlations, such as -.90, between pleasant and unpleasant emotional states (Diener & Emmons, 1984). Major explanations for this discrepancy included random and systematic measurement errors involved in the type of response format and the selection of measurement items that are semantically bipolar opposites (See Feldman, Barrett & Russell, 1998 and Russell & Carroll, 1999). However, I argue that another, possibly more critical, problem that involves this correlation framework is the arbitrary cut-off point that determines different modes of motivational activation. For instance, what would the exact ranges of correlation values be for the different categories of activation patterns? It may be unclear whether $r = –.20$ describes a clearly different activation pattern than r = .00 or r = .20. This question led the present study to utilize additional analytical strategies, including the comparison of bipolar and bivariate valence ratings and examination of the associations between valence and arousal. Consistent findings obtained from each of these analyses added more confidence in the primary conclusions of the present study—the partially independent occurrence of approach and avoidance motivations. The employment and development of a diverse analytical framework to provide empirical evidence on the non-reciprocal motivational activation is the first noteworthy contribution of the present research to the study of motivation.

The latter speculations about the dominance of reciprocal activation of approach and avoidance motivations are in line with the original theory: Cacioppo & Berntson

(1994) made it clear that while non-reciprocal activation patterns exist, reciprocal activation is a primary activation pattern of motivational valence systems and that positivity or negativity is exclusive in most cases. They also posited that the coactivated motivational states typically gravitate toward bipolarity over time because people tend to avoid ambivalent and nonharmonious states and want to maintain a simple and consistent representation of the world (Cacioppo & Gardner, 1999; Larsen, Norris, McGraw, Hawley, & Cacioppo, 2009). Indeed, it is well known that an inconsistency in one's psychological process impels the individual to reduce or eliminate the imbalanced state (Festinger, 1957; Heider, 1946; Wicklund & Brehm, 1976). Applying this theoretical idea to the present findings, the coactivation of positivity and negativity indicates a motivational conflict or ambivalence, which may represent unstable and imbalanced psychological states. Therefore, even if initial evaluative processes were not reciprocally activated, a need for consistency may next lead to the primacy of either negative or positive evaluations, i.e., reciprocal motivational activation (Cacioppo, Gardner, & Berntson, 1997; Larsen, McGraw, & Cacioppo, 2001).

Another finding may be particularly relevant to this discussion. The visual investigation of the distribution of valence ratings (RQ1, Analysis 1-1) indicated that the non-reciprocal motivation activation patterns were most likely to be found near the midpoint of the bipolar valence scale, whereas reciprocal patterns appeared strongest at extreme positive or negative values. Similar findings were reported in previous studies (e.g., Diener & Iran-Nejad, 1986), showing that positive and negative emotions are mutually exclusive at high levels of either valence, but often coexist at moderate levels.

This rare occurrence of motivational coactivation may reflect a greater desire for consistency at a higher level of motivational conflict compared to low or moderate levels of co-activation.

Based on the dominance of reciprocal activation pattern found in this and previous research, one may raise questions such as the following: Why do we need to consider the relatively less frequent occasions where the positive and negative motivational substrates non-reciprocally occur? Are the bipolar structure of motivational space and the use of popular bipolar measures not sufficient in examining effects of health messages? Findings from the second part of the present research may provide compelling answers for such questions.

Implication of the Bivariate Conceptualization of Approach-Avoidance Motivation in Health Communication Research

The possible advantage of operationalizing motivational valence systems on a bivariate space was first examined through a comparison of positivity and negativity ratings obtained from a conventional bipolar measure and alternative bipolar measures (**RQ4, Analysis 4**). The results revealed that the observed lack of change on a bipolar measure can consist of different combinations of underlying motivational substrates rather than the inactivity of both. For example, a similar neutral value found in two ads (approximately 3.80 on a seven-point bipolar scale) was not the product of inactivity in both positivity and negativity, such as the combination of 3.80 and 3.80, to simplify. Rather, the lack of change was a result of fairly distinctive combinations, such as a positivity value of 4.48 with a negativity value of 2.78 in one ad and a positivity value of

3 with a negativity value of 4.28 in another ad. In other words, in the present study, some ads appeared to fail to produce an intended positive reaction not because they were completely unable to produce an approach motive but because they simultaneously induced a negative motive that canceled out the influence of the positive drive, which the message in fact produced.

This finding is crucial. It clearly demonstrated an evaluative situation in which various underlying mechanisms were masked by the inability of a conventional bipolar measure to identify the origin of the observed change, suggesting the need to employ alternative unipolar measures. This finding is theoretically meaningful because to the best of my knowledge, it is the first empirical demonstration of the hypothetical combinations of motivational substrates that underlie ambiguity (Cacioppo & Berntson, 1994; Kaplan, 1972), in which alternative self-reported measures were used in the context of examining the effects of antidrug health messages.

The practical implication of this finding is equally important. Pundits often discovered the ineffectiveness of a health message that was intended to be persuasive. Knowing that a health message was only a half success and a half failure because of a specific (combination of) underlying reaction is far more informative than concluding that the message was a complete failure to motivate people to move toward the message-aimed direction. With the traditional bipolar approach, which is an exclusive focus on either approach or on avoidance motivations in message evaluation processes, it has been difficult to explain unexpected or paradoxical consequences that can be derived from the other unfocused drive. On the contrary, the bivariate framework can help identify the

exact source of change among approach motivational processing, avoidance processing, or both, which is responsible for the little or backfiring effect.

The last set of findings from the present study demonstrated that the bivariate approach is also beneficial in the development of health messages by better predicting a persuasive outcome and identifying which motivational process is responsible for the outcome. The result of the test of two competing models (a model with a bipolar motivational valence versus an alternative model with separate positivity and negativity) showed that the alternative model better predicted message recipients' convincingness evaluation on antidrug messages than the bipolar model (**RQ5a, Analysis 5-1**). If a typical bipolar valence measure can sufficiently represent the structure of motivational valence, and, thus, the increase in one valence system is equivalent to the decrease in the other system, the two rival models should not differ in predictive power. The present finding that the predictive power of the alternative model with separate positivity and negativity measures was stronger than that of the bipolar valence model suggests that there are some areas in the motivational structure, which the two substrates of valence do not share in explaining changes in the subsequent outcome. This result also indicates additional evidence on the partially independent nature of the approach and avoidance motivations, as hypothesized by ESM.

The importance of the bipolar framework is not limited to the evaluation of the effect of health messages. Rather, it also provides significant implications for the design of health message strategies. In the last analysis to examine the relative influence of the positivity and negativity of motivational valence on message convincingness perception

(**RQ5b, Analysis 5-2**), both motivational reactions positively influenced message convincingness, whereas the relative importance of avoidance reaction was stronger than the influence of approach motivation. On the contrary, the prediction of message effectiveness in the bipolar model suggested a different interpretation about the role of motivational valence: Positivity reactions negatively influenced perceived message convincingness.

The interpretation of this finding should be confined to the context of the present study, which is the examination of motivational reactions to antidrug messages. However, three things are worth mentioning regardless of context. First, a message strategy decision that is guided by the prediction of the bipolar model can be substantially different from a message design strategy that is guided by the prediction of the bivariate model. This concern raises the possibility that the use of a bipolar measure is not only insufficient but also potentially misleading. For instance, if a researcher concludes that the lack of change in the intended outcome is due to an insufficient increase in approach motivations, when in fact it was mainly due to a slight level of coactivated aversive motivations with a significant impact, a future message strategy based on the one-sided conclusion may result in unintended boomerang effects. Second, other types of persuasion outcomes in a different (health) setting may be more affected by approach motivation than by avoidance motivation. This postulation can be supported by another essential framework in health research, message framing. While the relative usefulness of gain- or loss-framed messages, which is the subject of lingering debates, is beyond the scope of this study, the idea that the primary focus of a message strategy on either

aversive or appetitive reactions should be specific to the target behavior can be directly linked to the idea of the present finding. Finally, when we continue to solely rely on the typical bipolar view and measures, these types of contemplations would be impossible. Knowing that the two types of motivational processing can be separately activated and that one may be more effective than the other in influencing a persuasive outcome may put health communication researchers and practitioners in a good position to develop effective message strategies. The present dissertation serves as one of the initial exploratory efforts to ring the alarm bell in the field of health communication.

Limitations and Future Studies

Despite the theoretical and practical importance of this study, it also has several limitations that are worth mentioning. First, the finding that the majority of ads examined in this study appeared to exhibit the reciprocal pattern of motivational activation can partly be attributed to the study material, the antidrug advertisements. The inherent valence of an antidrug message or the target behavior (i.e., illicit drug use) is likely to be negative, working against the inducement of both appetitive and aversive reactions. Unlike the materials used in this study, other health topics possibly have the potential to simultaneously arouse positive and negative motivational systems. For instance, a person may be motivated to lose weight for health reasons, but at the same time, this person may want to avoid the arduous workout or diet process to achieve the goal. These conflicting desires may be manifested as a co-activation of the approach and avoidance motivations in response to a health message that promotes physical exercise. Given that the

motivational activation process might be context specific, a replication study that focuses on a different type of televised health message/health topic is therefore needed to validate the findings of this study.

Second, the discrepancies found between the two types of bivariate measures used in this research needed to be revisited. Although non-reciprocal patterns of motivational activation were demonstrated by both measures, the magnitude of the effects and the decision of activation patterns for specific ads differed as a function of the type of the measures. This divergence was first found in the pilot study and was later validated in the main study with a large size of ad samples. Initially, two cases were suspected for the potential finding of divergence. Despite the effort to minimize a carry-over effect for BEAMs (e.g., randomizing the order of positivity and negativity measurement items), motivational reactions that are rated later can be likely influenced by the set of measurements rated first for the other motivation, and this results in polarized responses. The format of ESG, which presents the positivity and negativity options at the same time, possibly pushes the respondents implicitly to report both positive and negative reactions, and this results in ambivalence. However, unlike the conjectures, the number of ads determined as "coactive" between the two measures did not substantially vary. Instead, a notable difference was found in the specific ads that were determined to be coactive. An additional study is therefore needed to further explore this finding and thus determine which of the two measures can more accurately assess the bivariate structure of motivation.

Related to the preceding point, a particular finding of this study may provide a useful cue for the inclusion of a third measure that will be the gauge of the decision. Note that the present study and previous ones supposed a human consistency motive as one of the reasons for the rarity of coactivation. The activation of the approach and avoidance motivations might be simultaneous during the early stages of an evaluative process, but it will likely be manifested as bipolar in later phases of the message processing. The present study only utilized retrospective self-reported scales to measure the induced approach-avoidance reactions, so the various types of motivational reactions that occurred during the duration of the study could be summarized as either positive or negative by the time the participants report their reactions to fulfill the consistency desire. Therefore, using a real-time measure, as well as the two measures examined in the present study, would be useful for future studies in two aspects. First, the third measure can provide a yardstick to determine the convergent validity of the two measures. Second, possibly more interestingly, the real-time measure may allow researchers to identify where the discrepancy originates. For instance, given that both of the measures showed that non-reciprocal activations existed, but they differed in the specific ads that produced the non-reciprocal activation patterns, it is conceivable that the two measures possibly reflect different stages (e.g., early stage, middle stage, or end stage) in the evaluative process. This potential finding would be more informative than just knowing which of the measures present good convergence to a third measure.

Third, this study focused on empirically demonstrating the theoretical idea of non-reciprocal activation in response to health messages, but the discussion could have been

richer if the antecedents of motivational activation were also examined. As Cacioppo and colleagues (Cacioppo, Gardner, & Berntson, 1997; Cacioppo & Gardner, 1999) noted, an advanced question regarding the bivariate framework would be under what conditions the two substrates of motivation are reciprocally or non-reciprocally activated. A number of factors may influence the activation (patterns) of approach and avoidance motivations at both message-recipient and message-feature levels. For instance, particularly relevant to the inducement of the approach and avoidance reactions could be individual differences in reactivity to positive and negative information. Indeed, interest in the role of such individual tendencies on motivational message processing has substantially grown in communication research in recent years (Lang, Shin, & Lee, 2005; Lang, 2006; Lang, Kurita, Rubenking, & Potter, 2011). This movement is critical, but in their work, message recipients' motivational reactions in response to positively or negatively valenced stimuli were re-operationalized as individuals' baseline tendencies in the activation of appetitive and aversive motivations (e.g., Lang, Shin, & Lee, 2005; A. Lang, Bradley, Sparks, & Lee, 2007; Yan & Dillard, 2010). I argue that intrinsic approach-avoidance tendencies are distinctive of the message recipients' approach-avoidance motivational reactions. Approach and avoidance reactions are considered to evolve in different forms that range from baseline brain activities (i.e., intrinsic individual tendencies) and affective and cognitive responses to specific physiological and behavioral movement (Elliot, 2006). For example, among these hierarchical manifestations of approach-avoidance motivations, the emotional state of activated motivations was the focus of the present study; such a state functions as an outcome variable elicited by

external stimuli (in this case, antidrug messages) and is expected to serve as a precursor to subsequent behavioral outcomes. On the contrary, the approach-avoidance motivation operationalized as an individual tendency should serve as an antecedent variable that influences the activation of approach-avoidance reactions (Carver & White, 1994; Carver & Harmon-Jones, 2009). In future studies, researchers may need to be cautious about the mixed conceptualization and interchangeable use of the two distinctive conceptualizations of motivational valence systems, especially when they investigate the antecedents and consequences of motivational message processing.

Another important antecedent of the motivational reactions, which is subject to further investigation, is the message characteristics that induce the direction and patterns of motivational reactions. Just like the present study that focused on the link between motivational reactions and a message effectiveness outcome , extensive attention has been directed in the literature to the associations between emotion and persuasion. However, in line with other researchers (e.g., Dillard, Kinney, & Cruz, 1996; Dillard & Meijnders, 2002; Nabi, 2002; O'Keefe & Jackson, 1995), I argue that a link between message and emotion (or other types of intermediate evaluative reactions) should deserve far more attention than the status quo. In the context of the present study, one of the message characteristics of an ad, which was determined as "independent" in its positivity and negativity activation pattern by both ESG and BEAMs, included a twist in the plot and tone. It begins with a gray tone and the sound of a girl who is breathless for an unknown reason, but later it turns out that she is jogging in the morning (as her way of recovering from drug addiction) and is greeted by her father. For a systematic

investigation of this association between message feature and motivational activation, a content analytical framework used in a previous study (Kim, Yzer, Luciana, MacDonald III, & Vohs, 2012) might be useful. Because the majority of health messages available online or on TV consist of complicated audio-visual features, speculating on the features of health message stimuli that may notably promote a particular pattern of motivational reactions would be valuable.

Finally, despite their theoretical and practical implications, the findings of the present study are somewhat descriptive. Evidence of the non-reciprocal activation of the approach and avoidance motivations and the potential benefits from the separate conceptualization of motivational systems is important, but this finding in itself cannot directly reveal the consequences of different activation patterns on the attitudinal/behavioral changes. Given that a persuasive health message ultimately aims to achieve such goals, a follow-up study that addresses the ramification of the different activation patterns on attitudinal/behavioral outcomes in both the same and different health message contexts is necessary.

Conclusion

It is basic knowledge that any organism, including humans, is inherently programmed to avoid negative external stimuli while seeking positive stimuli to survive. Neither is it a new idea that negative or positive health messages, as one type of external stimuli, can elicit various types of motivational processing. What was needed to be studied was whether the two fundamental, but distinctive, human motivations have been

fully or equally importantly considered in the interpretation, evaluation, and prediction of the effects of persuasive health messages. The present study took a first step to answer this question by challenging the prevalent bipolar framework of emotional structure and testing an alternative bivariate framework.

The bivariate evaluative space model that served as the main theory of the present dissertation has been developed in the tradition of Darwinism and long been tested, challenged, and revised in various fields. The advanced technology in neuroscience research enriched this area of research by allowing researchers to connect the abstract psychological phenomenon to the concrete brain activities. I reiterate that I do not underestimate the great body of extant literature on and the movement toward incorporating this bivariate idea to the investigation of health message effects in the field of communication. Communication scholars already underscored the importance of embracing the bivariate idea, as Knowles and Linn (2007) mentioned that a movement toward a goal (e.g., attitude change) is the product of the joint function of two different motives, so that the total strength and relative importance of each motive should be considered when investigating the underlying processes of a manifested persuasion outcome. However, what I emphasize is that opportunities to apply the principles of the bivariate approach-avoidance framework to the current health communication research and practice are innumerable. Findings from the present study indicate that individuals can develop approach and avoidance responses simultaneously while the ambivalent state is less likely to occur than bipolar reactions and is more difficult to demonstrate. This study also found that the bivariate framework can help researchers better understand the

(unexpected) outcome of health messages and help practitioners make a wiser decision in selecting appropriate message strategies. The anticipated outcomes of extending these findings to other health contexts would be fruitful in shedding light on health message processing.

For those who are still skeptical about the utility of the bivariate approach and maintain that the bipolar representation of the world is sufficient to understand health message effects, I quote an analogy that I found to be a compelling response:

> "A current of water flowing from a hose pointed south and another current of water flowing from a second hose pointed north represent two independent and antagonistic forces with a net effect defined well by a simple vector difference. The force of each current flow depends on the independent control of each hose, yet their net effect is the conjunction of these forces. If what one wants to know is the net current flow, a bipolar (difference) measure will perform well. If, however, one wants to understand the processes underlying the net current flow, models and measures that focus on the actions of each source are required (Ito, Cacioppo, & Lang, 1998, p. 877)."

The present dissertation was the first empirical demonstration of this figurative idea in the field of health communication. Despite a number of limitations that needed to be addressed in the future, this is the most unique contribution of the present study to the current health communication research.

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APPENDICES

Informed Consent Form

CONSENT FORM

Title of Study: Evaluation of Televised Health Messages

You are invited to participate in a study evaluating the effect of antidrug television advertisements. You were selected as a possible participant because you are amongst 18 to 24 year-olds and you have expressed interest in participating. We ask that you read this form carefully and ask any questions you may have before you agree with participating in this study.

This study is being conducted by Soyoon Kim, a PhD student in the School of Journalism and Mass Communication at the University of Minnesota.

Study Information:

The purpose of this study is to learn more about college students' evaluative responses to different anti-drug television PSAs, in particular anti-drug video ads. If you agree to be in this study, we would ask you to do the following things: First, you will be asked to participate at a designated computer in the Social Science Lab in Anderson Hall (or in the SJMC Research Lab in Murphy Hall). You will be asked to fill out some demographic questions, to watch eight anti-drug advertisements on a computer screen, and to provide feelings/ thoughts you have while viewing each ad by rating on multiple scales. After you have completed all rating tasks, we will ask some questions about your values, and your experience with substance use such as tobacco and marijuana. All your responses will be completely confidential. No identifying information will be kept by the researchers, and all study records will be stored securely. The estimated completion time will be 25-35 minutes.

Risk and Benefits of the Study Participation:

This study involves minimal or no risks. All antidrug ads used in this study were produced and approved by the Office of National Drug Control Policy (ONDCP). The most sensitive thing you may be asked to provide is your substance use experience. However, all responses collected during the study session will be separated from any identification information and thus nobody will be able to link you to your responses. In addition, all collected data will be stored and kept in a secured computer. Your participation in this study may have important implications for health communication research in designing more effective media health messages and developing rigorous evaluation processes.

Compensation:

In exchange for your participation in this study, you will receive extra course credit (or $10 Starbucks gift card / $10 cash).

Confidentiality:

Any identifying information (e.g., your U of M x.500 ID) that is used to contact you earlier or to grant extra course credit (or a Starbucks gift card) will be completely separated from your responses and deleted from our files after completion of this study session. No personally identifiable information will be attached to your responses and thus no one will be able to link you to your responses recorded in a study session. In addition, the records of this study will be kept in password-protected computer files securely. In any sort of report we might publish, the researcher will not be able to include any information that will make it possible to identify a subject.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to decline, there will be no penalty. If you do participate in this study, you can also discontinue at any time without affecting those relationships.

Contacts and Questions:

You may ask any questions you have now. If you have any further questions or concerns regarding this study, please contact Soyoon Kim (kimx1837@umn.edu) at 330 Murphy Hall, 206 Church Street S.E. Minneapolis, MN 55455; (612) 626-0221 or Prof. Marco Yzer (mcyzer@umn.edu) at 306 Murphy Hall. If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D-528 Mayo, 420 Delaware Street S.E., Minneapolis, Minnesota, 55455.

Statement of Consent

- ☐ I have read and understood the above information. I have had opportunities to ask questions and to receive answers. I consent to participate in the study.

- ☐ No, I do not consent to participate in the study. (You will be exited from the study.)

Study Questionnaire

We appreciate your participation in this experiment.

In this study, we are interested in how people respond to televised health messages. For the next 25-35 minutes, you are going to watch several antidrug ads on the computer screen, and will be asked to rate each ad on multiple scales in terms of how it made you feel or think. There are no right or wrong answers, so simply respond as honestly and accurately as you can. Your answers will remain confidential.

Please carefully read instructions provided at the beginning of each section.

[Page break on the computerized questionnaire]

Before you begin to rate a set of ads, we would like to ask you to give us a little information about yourself. Again, all your answers will remain confidential.

Q. dem1
What is your age? *(in years)*

_____

Q. dem2
What is your gender?

Male
Female

Q. dem3
Which of these groups best describes your racial or ethnic background?

White / Caucasian (such as Non-Hispanic White)
Hispanic / Latino (such as Mexican, Puerto Rican, or another Spanish background)
Black / African American
Asian / Asian American
Other (such as American Indian, Alaska Native, Native Hawaiian or Other Pacific Islander)

Now you are going to watch eight antidrug television advertisements. After watching each of the ads, you will be asked to rate how positive and/or negative you felt while viewing the ad.

[The following instructions vary according to study measurement conditions]

Condition 1 & 2 (Bipolar Valence Measure and BEAMs):
Now you are going to watch eight antidrug television advertisements. After watching each of the ads, you will be asked to rate how positive and/or negative you felt while viewing the ad. When you are done watching an ad, click the "Next" button that will appear at the bottom of the screen to proceed. **Do not touch** the video's control bar once the ad is playing.

Condition 3 (ESG):
In particular, we will ask you to rate how positive and/or negative you felt while watching this ad on a kind of map for feeling, called an Evaluative Space Grid. On the next screen, there will be instructions demonstrating how to rate your responses using the grid. Please read the instructions carefully and spend some time to practice the rating task.

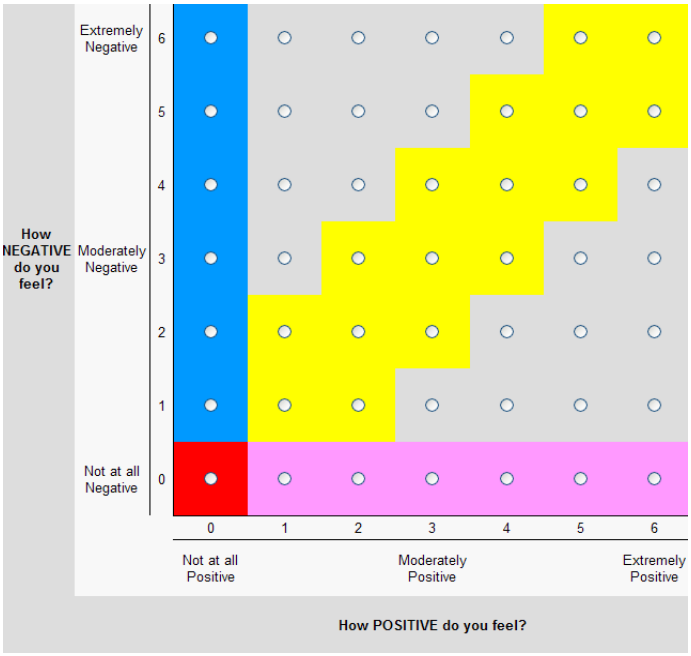
[Present the ESG practice screen here: this practice screen will appear only for participants assigned to use ESG]

One way to describe your feelings about an advertisement is in terms of how positive and how negative you feel about it. The grid below asks you two questions: Along the horizontal axis, it asks *how positive you feel* about the advertisement from "not at all" at the left to "extremely" at the right. Along the vertical axis, it asks *how negative you feel* from "not at all" on the bottom to "extremely" on top. Please click the “Next” button at the bottom of the screen when you are ready to continue.

;Extremely Negative (7) to Not at all Negative (0) (Y axis)
;How NEGATIVE do you feel?

;Extremely Positive (7) to Not at all Positive (0) (X axis)
;How POSITIVE do you feel?

[The ESG presented on the computer screen during the practice time]



Let's practice how to use the grid. This is just to help you get a feel for how the ratings are done.

(1) If you feel positive, but not at all negative, where would you move the mouse?
- You may move the mouse into one of the six cells at the bottom edge depending on how positive you felt (pink area). The better you feel, the farther to the right you should go.
(2) On the other hand, if you feel negative but not at all positive, move the mouse into one of the six cells on the left edge (blue area). The worse you feel, the farther up you should go.

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(3) It is also possible that you feel not at all positive and not at all negative. If you feel neither positive nor negative, you can move the mouse into the cell in the bottom left (red area).
(4) Finally, if you feel both positive and negative, move the mouse into one of the cells in the middle (yellow area). Again, the cell you select will depend on just how positive and just how negative you feel. You might be

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also able to feel quite a bit negative and somewhat positive (left, upper-side gray area) or quite a bit positive and somewhat negative (right, lower-side gray area).

Inform the researcher if you have any questions during your practice session. When you are done with the practice, click the "Next" button to watch and rate an ad.

Let's practice how to use the evaluative space grid with a practice ad.

After watching an ad, place your cursor in whichever cell best describes your feelings. After you've reached that cell, click your mouse button to record your response. You can change the mouse location before you click the "Next" button to watch the next ad.

When you are ready to begin the practice ad, click the "Play" button.

Please click on the 'Play' arrow to begin the ad. **Do not touch** the video's control bar once the ad is playing

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Grid Practice Continued:
Please place your cursor in whichever cell best describes your feelings. After you've reached that cell, click your mouse button to record your response. You can change the mouse location before you click the "Next" button to watch the next ad.

We hope the practice session was helpful. There will be no more practice sessions. Now you will be asked to rate eight ads on the evaluative space grid.

When you are ready to begin, click the "Play" button on the video clip. **Do not touch** the video control bar while the ad is playing.

[Screen shot of the first shown ad: the presentation order of six ads included in each set was randomized (The loop was repeated until all six video clips were watched)]

Please place your cursor in whichever cell best describes your feelings. After you've reached that cell, click your mouse button to record your response. You can change the mouse location before you click the "Next" button to watch the next ad

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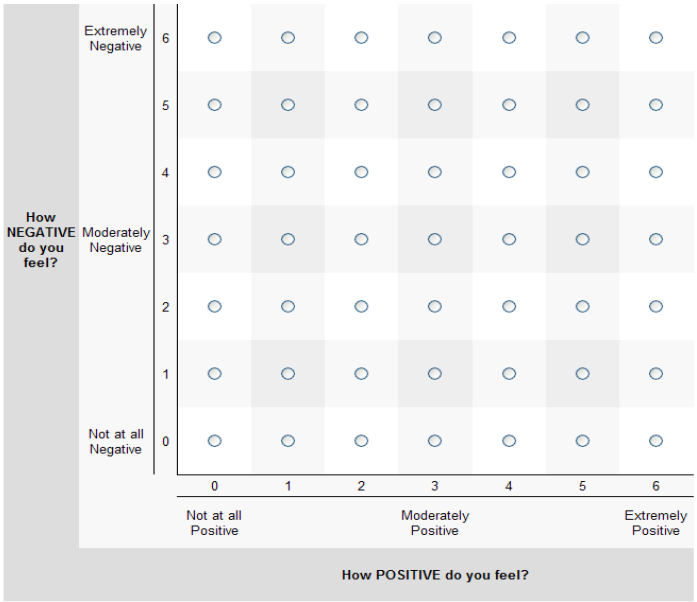
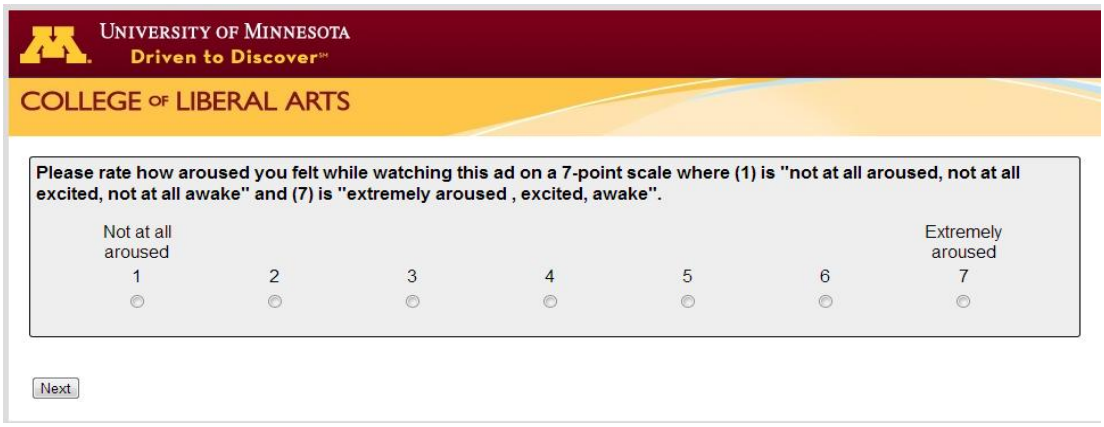
[The ESG presented on the computer screen for the actual rating task]



Q. Arousal
Please rate how aroused you felt while watching this ad on a 7-point scale where (1) is "not at all aroused, not at all excited, not at all awake" and (7) is "extremely aroused, excited, awake".

[Example of the arousal scale presented on the screen: the same scale was used for "excited" and "awake."]

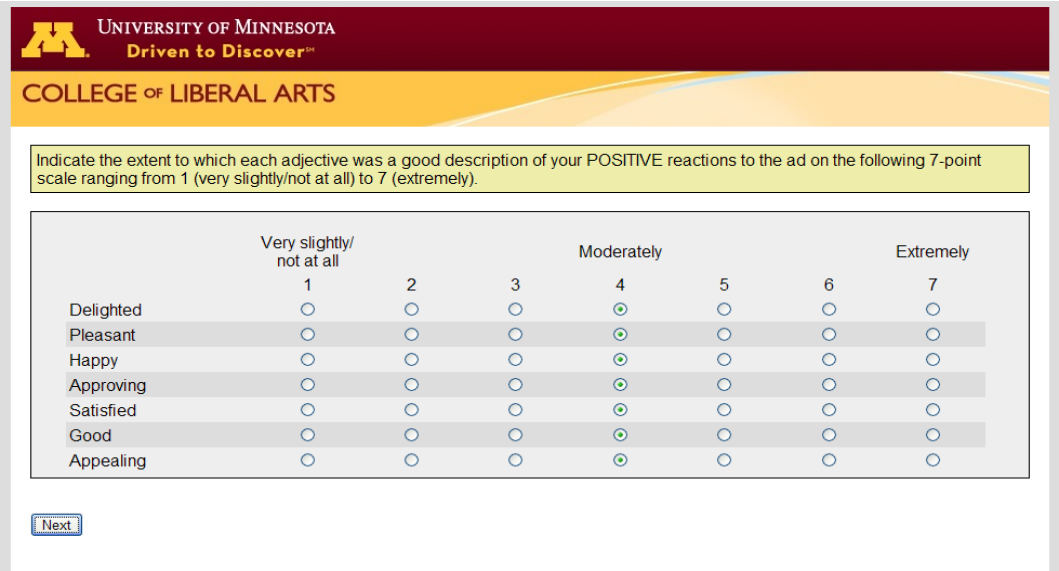


[BEAMs condition begins without a practice session. The following screens will appear only for participants assigned to use BEAMs]

Q. Arousal
Please rate how aroused you felt while watching this ad on a 7-point scale where (1) is "not at all aroused, not at all excited, not at all awake" and (7) is "extremely aroused, excited, awake".

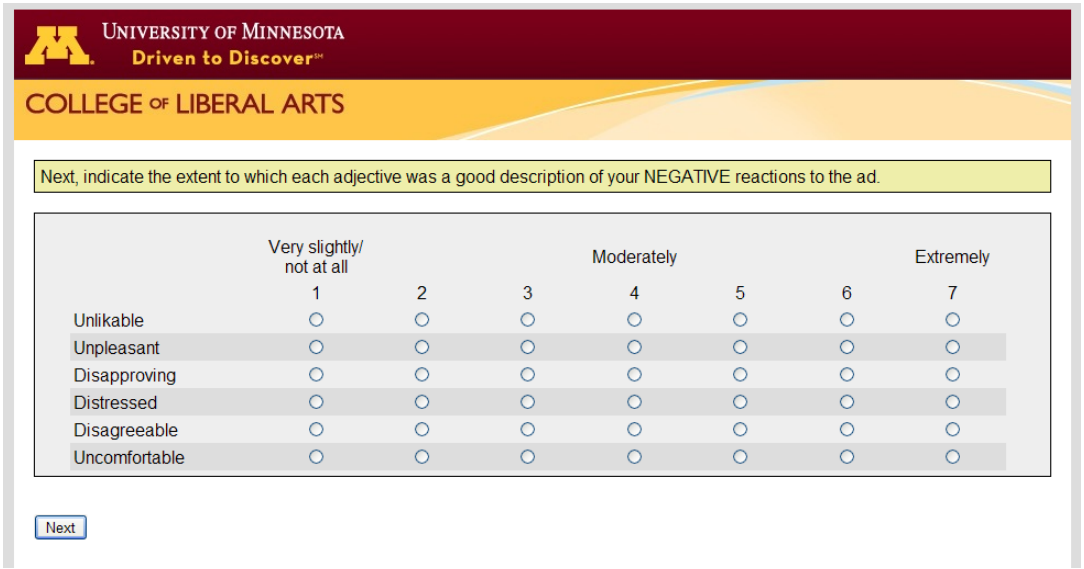
Indicate the extent to which each adjective was **a good description of your POSITIVE reactions to the ad** on the following scale. **Note** that the scale ranges from "**Not at all** (1)" to "**Extremely** (7)

[BEAMs *positivity* scale presented on the screen]



Next, indicate the extent to which each adjective was **a good description of your NEGATIVE reactions to the ad** on the following scale. **Note** that the scale ranges from "**Not at all** (1)" to "**Extremely** (7)

[BEAMs *negativity* scale presented on the screen: The order of the negativity and positivity scales was randomized by creating a counter-balanced experimental condition]

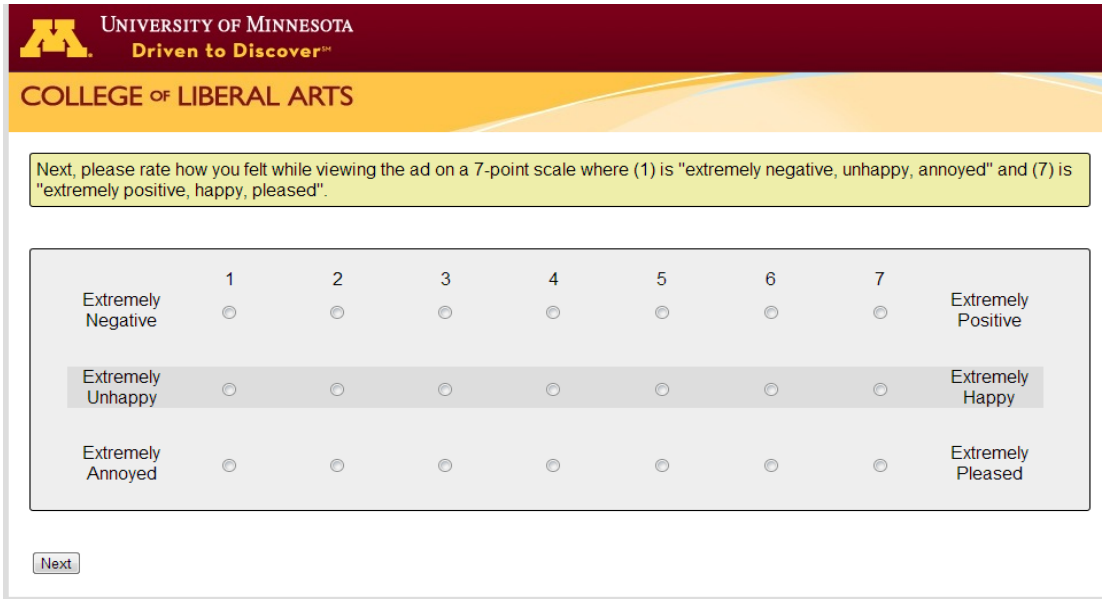


[Bipolar measurement condition begins without a practice session. The following screens will appear only for participants assigned to rate on a bipolar scale]

Q. Arousal
Please rate how aroused you felt while watching this ad on a 7-point scale where (1) is "not at all aroused, not at all excited, not at all awake" and (7) is "extremely aroused, excited, awake".

Next, indicate the extent to which each adjective was **a good description of your NEGATIVE reactions to the ad** on the following scale. **Note** that the scale ranges from "**Not at all** (1)" to "**Extremely** (7)

[3 items for the bipolar scale presented on the screen]



[The following questions were included regardless of the measurement type]

Perceived Message Effectiveness:
To me, this ad is...

COLLEGE OF LIBERAL ARTS

To me, this ad is...

	1	2	3	4	5	6	7	
Extremely Unconvincing	◉	○	○	○	○	○	○	Extremely Convincing
Extremely Bad	◉	○	○	○	○	○	○	Extremely Good
Extremely Forgettable	◉	○	○	○	○	○	○	Extremely Memorable
Extremely Ineffective	◉	○	○	○	○	○	○	Extremely Effective
Extremely Negative	◉	○	○	○	○	○	○	Extremely Positive
Extremely Worthless	◉	○	○	○	○	○	○	Extremely Valuable
Extremely Unpleasant	◉	○	○	○	○	○	○	Extremely Pleasant

You have finished the video section. Now we would like to ask some questions about you, your worldview, and your experience. There are no correct or incorrect answers, and your first response is usually the most accurate

Substance Use:
The next series of questions are about cigarettes and marijuana use. Please answer honestly and accurately.

Q. Have you ever smoked a cigarette?
- ❍ No
- ❍ Yes, but I do not smoke anymore
- ❍ Yes, and I still smoke

[The following question was presented only if the participant select “Yes” to the previous question]

Q. How many cigarettes do you smoke on an average day?

_____

Q. Have you ever, even once, used marijuana?

- ❍ No
- ❍ Yes, but I do not use marijuana anymore
- ❍ Yes, and I still do

[The following question was presented only if the participant select “Yes” to the previous question]

Q. Please indicate which category best represents your typical use of marijuana.

- ❍ Almost every day
- ❍ 2-3 times per week
- ❍ Once a week
- ❍ 2-3 times per month
- ❍ Once a month
- ❍ Several times a year
- ❍ Less than once a year

Finally, there will be the last series of questions for this study. Please read following statements and indicate your level of agreement or disagreement with each by selecting the appropriate number. Please click “Next” to continue to the statements

Behavioral Inhabitation and Behavioral Approach Systems:
If I think something unpleasant is going to happen I usually get pretty "worked up."

I worry about making mistakes.

Criticism or scolding hurts me quite a bit.

I feel pretty worried or upset when I think or know somebody is angry at me.

Even if something bad is about to happen to me, I rarely experience fear or nervousness.

When I get something I want, I feel excited and energized.

When I'm doing well at something, I love to keep at it.

When good things happen to me, it affects me strongly.

It would excite me to win a contest.

When I see an opportunity for something I like, I get excited right away.

When I want something, I usually go all-out to get it.

I go out of my way to get things I want.

If I see a chance to get something I want, I move on it right away.

I will often do things for no other reason than that they might be fun.

I crave excitement and new sensations.

I'm always willing to try something new if I think it will be fun.

I often act on the spur of the moment.

❖ Disagree ❍1 ❍2 ❍3 ❍4 ❍5 ❍6 ❍7 Agree

[Example of BIS/BAS measures presented on the screen: Only five to six items were presented in one screen page]